FOUNDRY TRADE JOURNAL

EST. 1902

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OCTOBER 26, 1961
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VERSATILE MOULDING MACHINES

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OSBORN JOLT ROCK-OVER PATTERN DRAW MACHINES
No. 242W—1,500 lbs. JOLT LOAD
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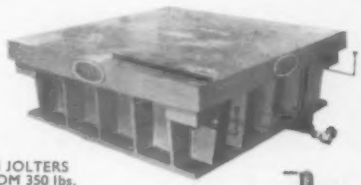

JACKMAN PLAIN JOLTERS SIZES RANGE FROM 350 lbs. LOAD TO 20 TONS

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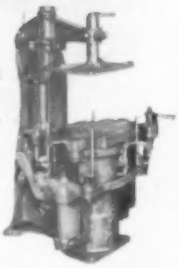
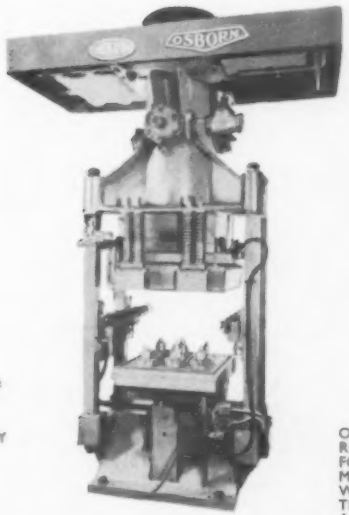
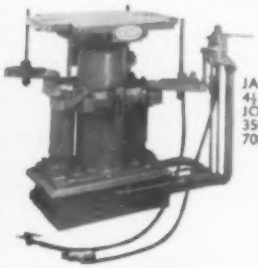




OSBORN 275J-1 PORTABLE JOLT SQUEEZE MACHINE FOR MATCH PLATE WORK



JACKMAN 3in. & 4½in. JOLT STRIP 350 lbs. & 700 lbs. CAPACITY

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Above: Mould half for a 15 ton casting. Cold set Corovit mixes are immensely strong and do not sag.

Below: Corovit rib cores are as accurate as the core boxes from which they are made.

MASSIVE CORES AND MASSIVE SAVING

Coremaking time reduced from 200 to 94 hours using Fordath's "Corovit" cold-setting technique—but men's earnings are up by 15% in piece-work bonuses.

Corovit cold setting core techniques have been applied in the building-up of the upper half of this mould for the table of a 22 ft. diameter vertical boring mill. Corovit provides savings at every turn—reduced coremaking time, quicker stoving, easier knock-out. Dimensional stability and enormous strength mean that cores are far more accurate (less fettling and subsequent machining) with an improved surface finish.

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COROVIT is manufactured and sold in the U.K. solely by FORDATH, who prepay licence fees to Reichold Chemie A.G. of Switzerland. Reichold are the proprietors of British Patents 653,530 & 761,035. Thus foundries using COROVIT are automatically free from liability to suit for infringement of these patents when they use peroxide-group accelerators in their cold-setting work.

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Telephone: West Bromwich 1665. Telegrams: Fordath Telex West Bromwich. Telex No.: 33415

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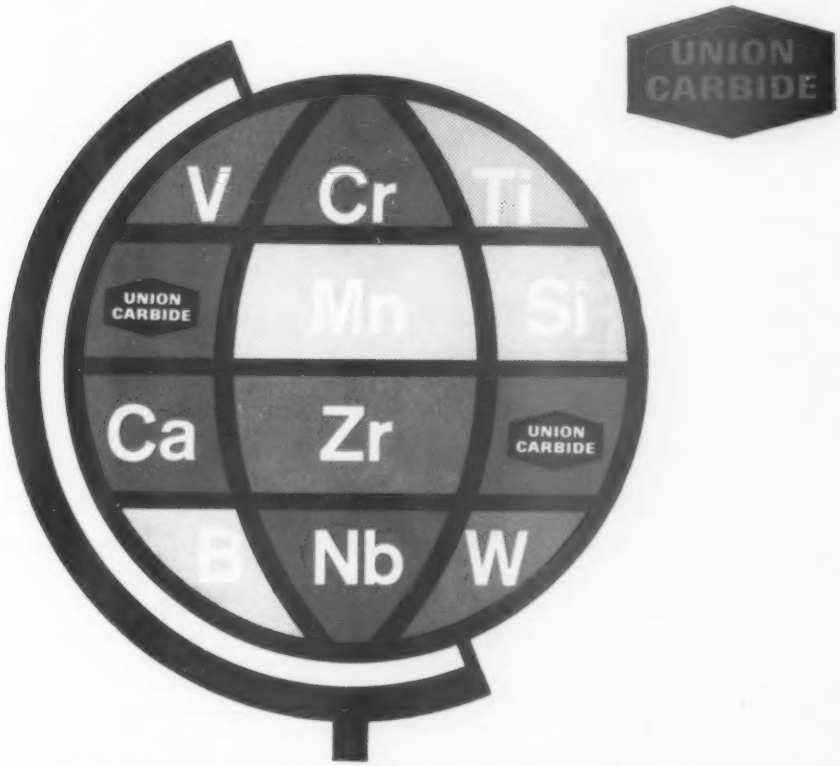

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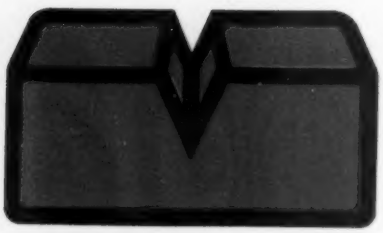
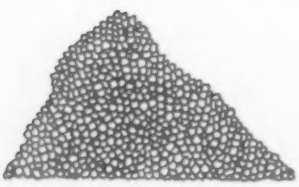




From The Everyday To The Unusual

The unequalled range of Union Carbide ferro-alloys and metals includes all the normal alloys used in the iron and steel industry right through to the rare metals used in refractories, rocketry, and jewellery. Many of the uncommon metals and compounds are available today as a direct result of Union Carbide research.

Many of the specialised ferro-alloys used in the production of new steels have been developed by Union Carbide in co-operation with the steel companies—e.g. the exothermic "Chromtemp" ferro-chromium, "Mantemp" ferro-manganese and "Siltemp" ferro-silicon. Other outstanding examples of this co-operation are the soluble ferro-alloys, "Silchromsol" silicon chromium for making 'Cor-ten' steel, and "Mansol" ferro-manganese.

Everyday

Cr over 20 run-of-the-mill and specialised chromium alloys (for instance "Simplex" 0.01% and 0.02%c. ferro-chromium) used throughout the steel and iron industry to control hardness, corrosion resistance and other vital characteristics: as well as two grades of chromium metal.

Mn more than 20 ferro and silico-manganese alloys for the iron and steel maker many of them produced exclusively by Union Carbide for the manufacture of highly specialised irons and steels.

Si silicon in more than 26 alloys, including 11 grades of ferro-silicon, boron and calcium-bearing silicon; the widely used SMZ alloy (silicon, manganese, zirconium); and silicon metal. Also Alloys 'VL55' and 'VL55(M)' for the manufacture of S.G. iron.

Zr zirconium alloys for improving age-hardening and low-temperature toughness in straight chromium steels, high strength structural steels and cast iron.

Unusual

B boron carbide, calcium boride, ferro-boron, manganese boron and nickel boron used to control the hardening qualities of engineering steels.

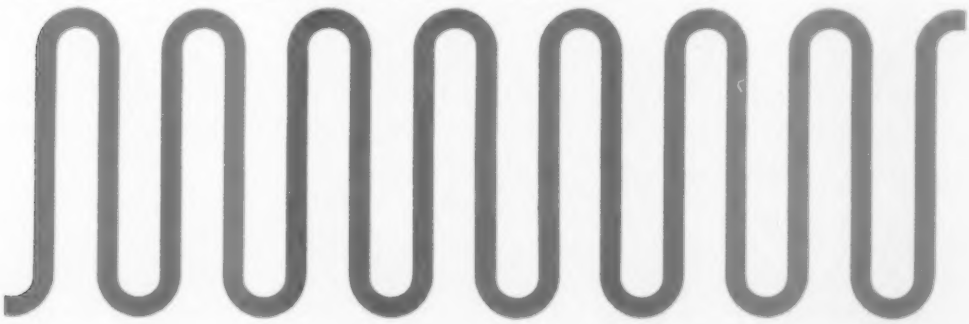
Ca calcium compounds such as calcium-manganese-silicon and other quality steel de-oxidisers and purifiers.

Nb less-common metals such as niobium and its alloys and ferrous grades, which have made possible a new order of high duty stainless steels and high temperature alloys.

Ti titanium compounds for deoxidising, cleansing and imparting special properties to a number of ferrous and non-ferrous alloys.

W upwards of half a dozen compounds of tungsten for high speed tool steels.

V Vanadium metal and its alloys and other compounds for high temperature, high speed steel cutting tools.



CRC A66 FJ

All the facts about the Union Carbide range

We are always ready to send a Union Carbide representative to tell you more about any metal or alloy that interests you, or if you will tick the relevant Union Carbide publication listed on this page and send it to us with your address we will send you a free copy without obligation.

Ferro-alloys and Metals Catalogue ☐

A comprehensive catalogue of products available from the Alloys Division. (Available shortly.)

Alloys and Metals Review ☐

A periodical which includes a review of the most recent products of the Alloys Division. New issues will be sent on publication.

BRIQUETTED FERRO-ALLOYS ☐ FERRO-ALLOYS IN THE FOUNDRY ☐ CURRENT FERRO-ALLOYS AND METALS LIST ☐

ALLOYS 'VL55' AND 'VL55(M)' ☐ "CHROMTEMP" FOR CHROME STEEL ☐ "SIMPLEX" LOW CARBON FERRO-CHROMIUM ☐

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• • • • • **Add charges for tip.**

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This will show that sand is your most considerable item of waste. *Up to 85% core sand* can be saved with a plant which will pay for itself in a very short time.

Please ask for a representative to call if you are interested

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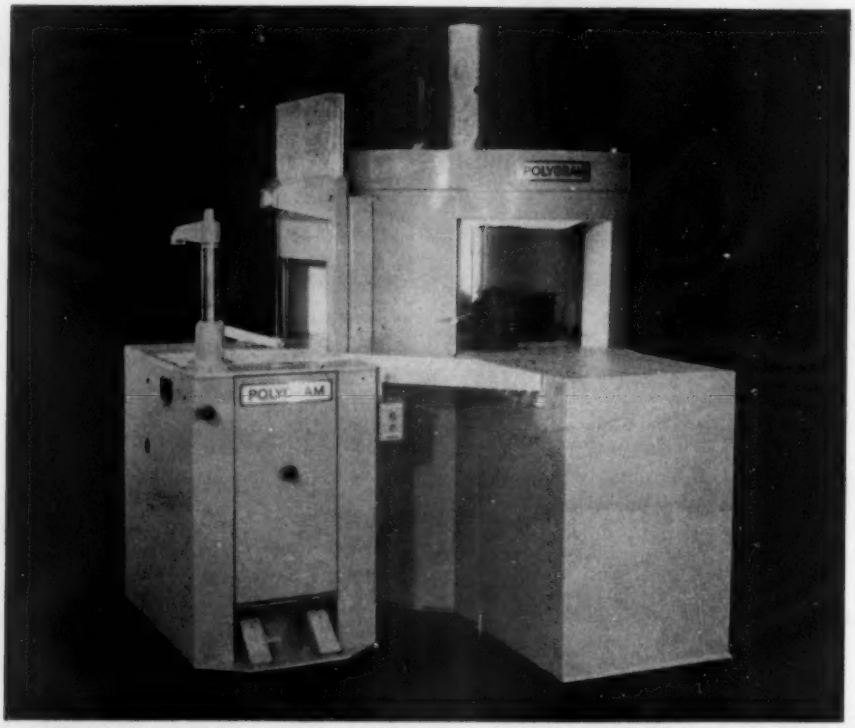
B

The POLYGRAM 8*

CMU SHELL COREMAKER

for Jobbing Foundries



Designed to bring all the economic and technical advantages of shell cores into *your* foundry, the latest Polygram CMU Shell Coremaker is the fruit of 12-years of continuous research by the only British Specialists in Shell Moulding and Coremaking. Note that the unit construction enables you to fit a CMU core blower or oven into your existing layout and to expand it into a full CMU Shell Coremaker at *your* convenience.

8* *Features of the Polygram CMU Shell Coremaker*

- Maximum Versatility
- Maximum Complexity-of-Core
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- Minimum Maintenance
- Maximum Quality
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- Minimum Skill
- Minimum Heat

Designed by Foundrymen—Built by Engineers

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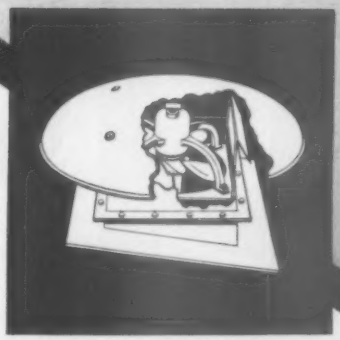
FENTON BYRN FANS for ventilation

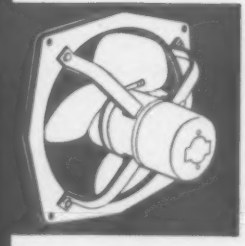
they help to increase production and raise efficiency by improving working conditions



For general and spot ventilation there is a Fenton Byrn fan to meet every requirement. Most can be met with powered roof ventilators, wall fans, diaphragm and ring fans.

Fenton Byrn research has developed a range of fans which have that extra performance and merits that ensure satisfaction.

An advisory service is available; you can take advantage of this without obligation.



Leaflets are freely available. Ask for: Roof Ventilator, Leaflet No. F/8/1; Wall Fan, Leaflet No. F/3/2; Ring Fan, Leaflet No. F8/9/2.

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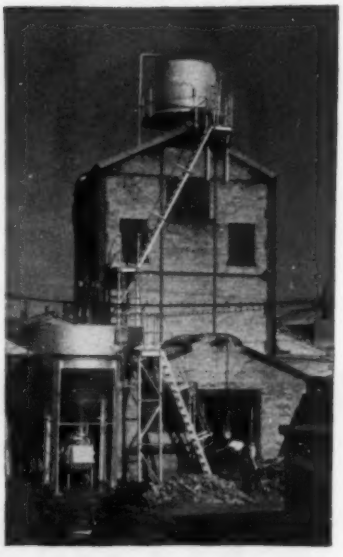
Coarse as grit . . .
fine as fume;

dust

If you want to control it, collect it, separate it, extract it, the people to get in touch with are Filter-Heat Ltd.

WHY?

For a very sound reason. They are not committed to any particular method of dust collection but are concerned with one thing only – the best way to trap a particular type of particle. It might be done with cyclones, cloth filters, wet collectors – or a combination of these. Filter-Heat makes them all. On a cupola, for example, they would recommend a water screen grit and spark arrester. The one illustrated here removes between five and six times as much grit and dust as the dry arrester it replaced. It also removes a considerable proportion of the sulphur in the gases. If you have a dust or grit problem; ring Leigh Lancs 72101 – or (in London) Abbey 3085. Filter-Heat take over from there.



Cupola at Willenhall equipped with a Filter-Heat grit and spark arrester – at Monmer Foundry Limited in St. Annes Rd.

FILTER-HEAT LTD

(a subsidiary of Sutcliffe, Speakman & Co. Ltd)

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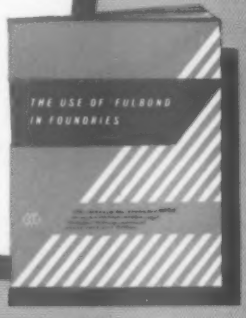
FOCUS ON 'FULBOND'

Nº6 'FULBOND' in naturally bonded moulding sands

The advantages of using FULBOND in natural moulding sands are:—

1. Considerable savings can be made by reducing additions of new sand and adding a small quantity of FULBOND to balance the moulding properties. It is a fallacy to assume that because of the initial cheapness of natural sands, large quantities can be discarded on the grounds of cheap practice. A large proportion of the discarded sand contains good bond, coal-dust, pitch or other organic materials, which are relatively expensive.
2. Low clay content sands can be quickly converted into useable moulding sands, simply by adding FULBOND and milling for 3-4 minutes.
3. The high absorption capacity of FULBOND will take care of some of the excess water which occurs in new sands in wet weather.
4. Sand mixes containing FULBOND can be prepared to any pre-determined green strength, irrespective of the combined properties of the new sand and reclaimed sand.
5. Very often, the milling facilities of jobbing foundries are inadequate to process all the sand in circulation. The addition of FULBOND will enable milling time to be reduced, thereby increasing the output of milled sand.
6. In foundries where sufficient milling capacity is available, FULBOND enables a unit sand to function in place of separate facing and backing sands.



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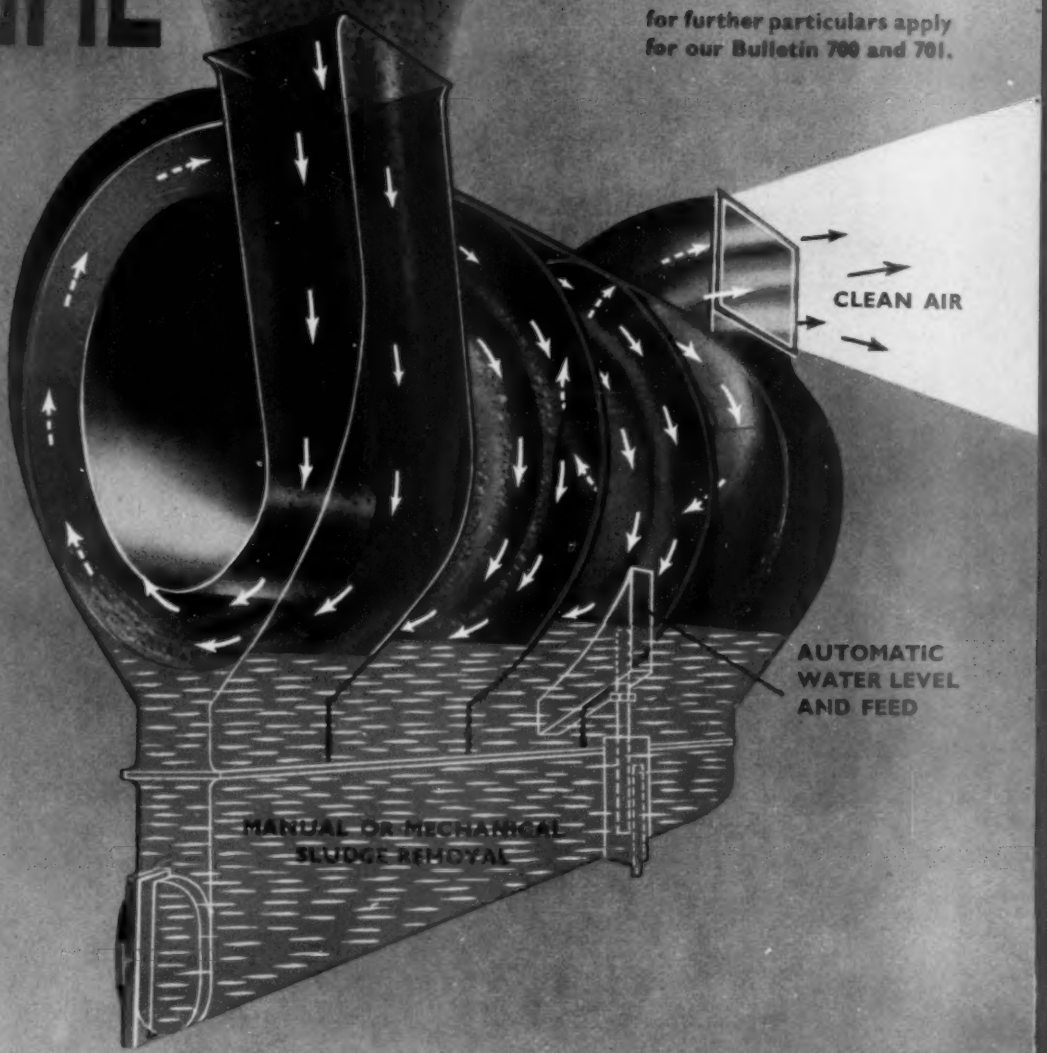
"The Air Tumbler"

British Patent No. 629292

THE MASTER OF DUST IN INDUSTRY

for further particulars apply for our Bulletin 700 and 701.



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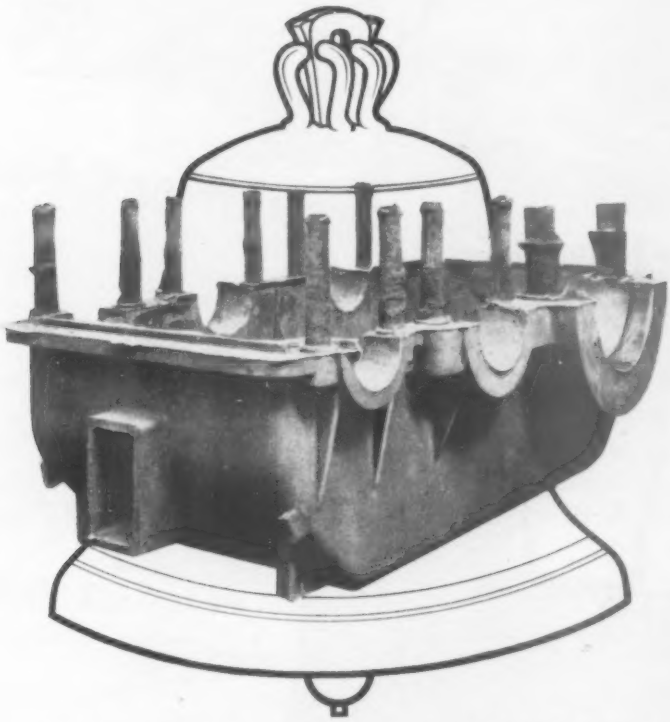

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By The Dudley Foundry Ltd., Staffs.

INFORMATION LEAFLET NO. 17 FREE ON REQUEST.

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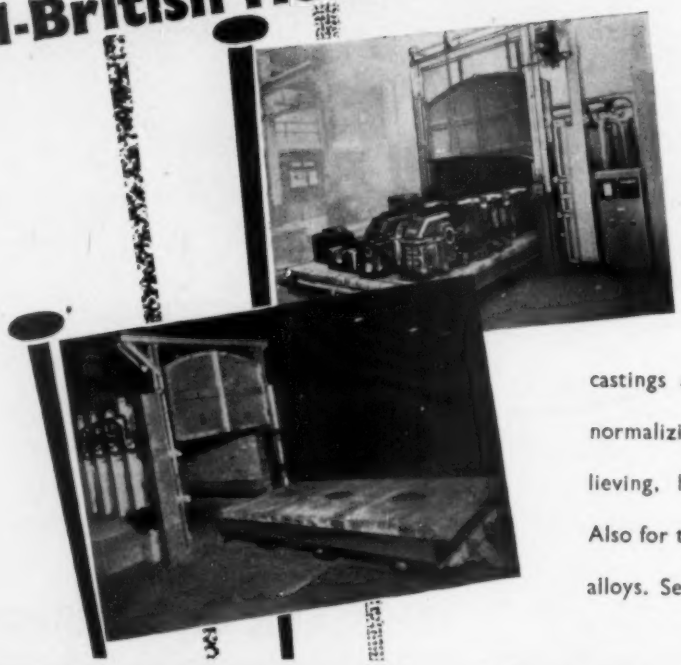
Manufactured by

HARBOROUGH CONSTRUCTION CO·LTD·MARKET HARBOROUGH

All-British Heat Treatment Furnaces



'NEWSTAD' heat treatment furnaces are ahead in design and performance. Suitable for S. G. Irons, and for the treatment of steel castings and forgings. Furnaces for normalizing, annealing, stress relieving, hardening and tempering. Also for the heat treatment of light alloys. Send for further information.

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we can control electric arc furnace fumes

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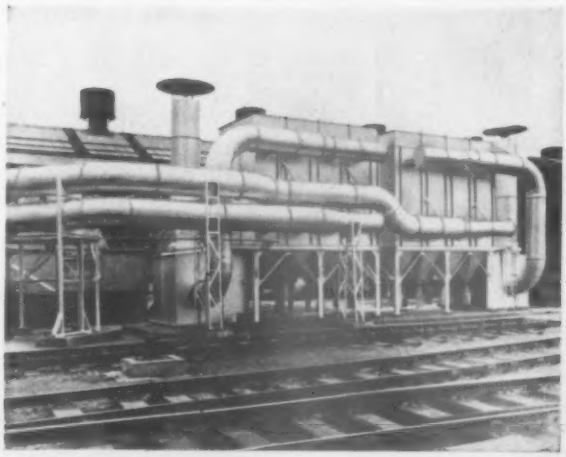
Tilghman High-Temperature Dust Collectors are now operating on ten British plants ensuring no visible discharge to the atmosphere even during oxygen refining periods.



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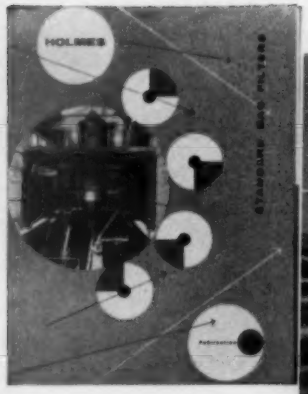
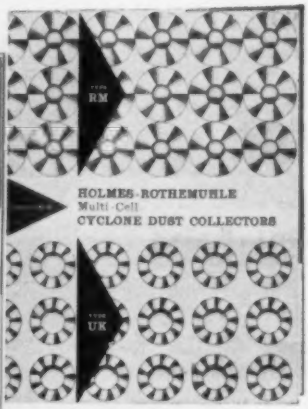
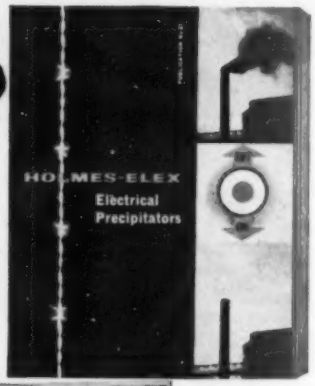




Which?



Which type of dust collection and control plant is most suitable, both technically and economically, for your particular application? A complete answer to this question lies within the pages of the various brochures illustrated. Have these brochures before you when you decide.

Ask for technical literature GCD/23

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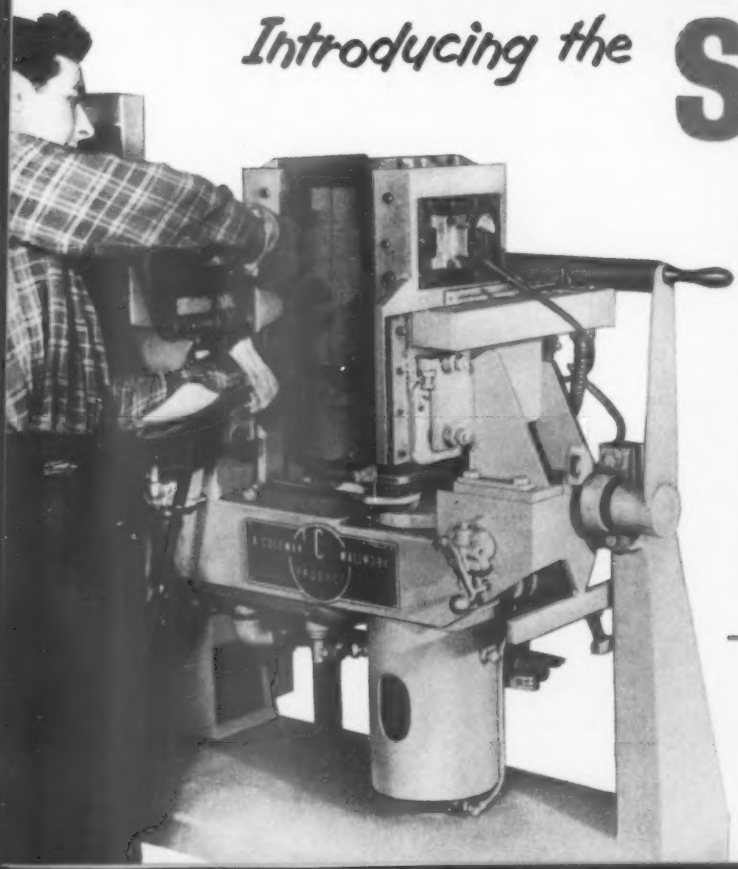

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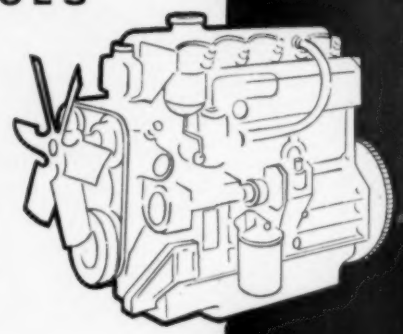

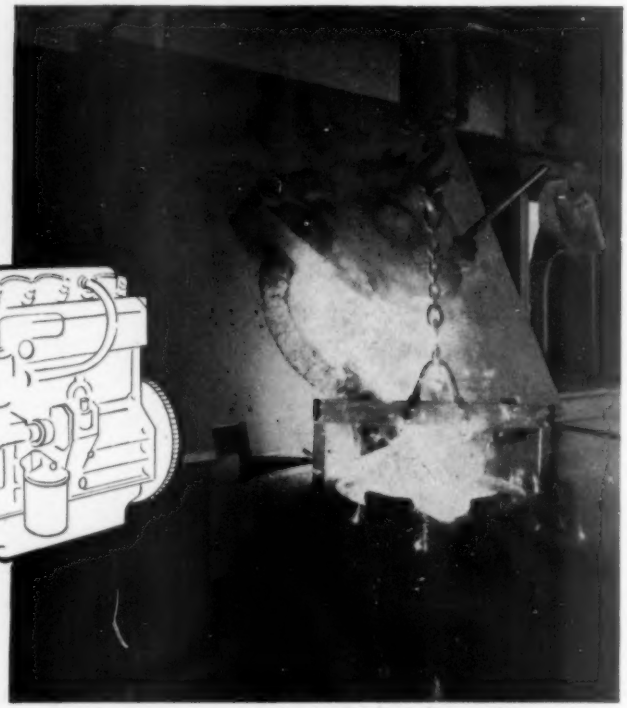

A mains Frequency furnace of 30 cwt. capacity and rated at 450kW. for melting iron and steel.

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Whether your melting equipment is geared for batch or continuous production requirements, there is a Birlefco furnace to keep the job in hand. A Birlefco mains frequency furnace, such as that illustrated, is equally suited to the production of ferrous or non-ferrous materials.
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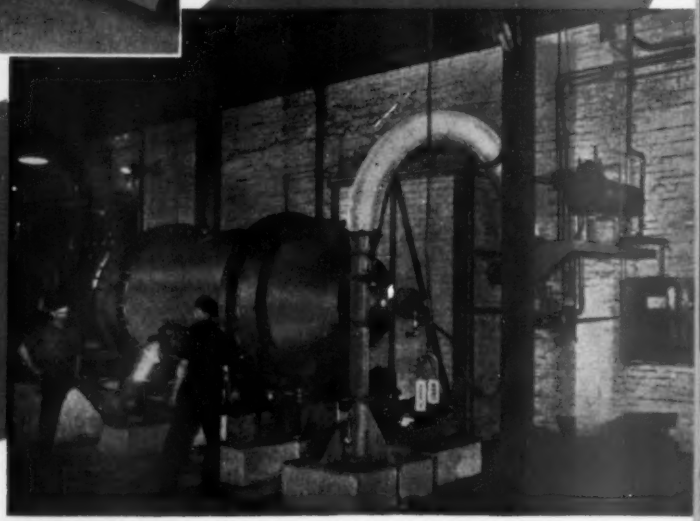

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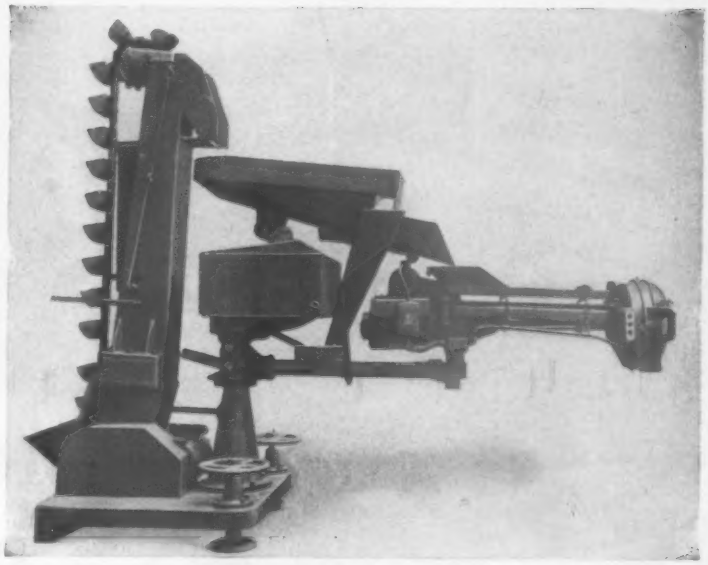

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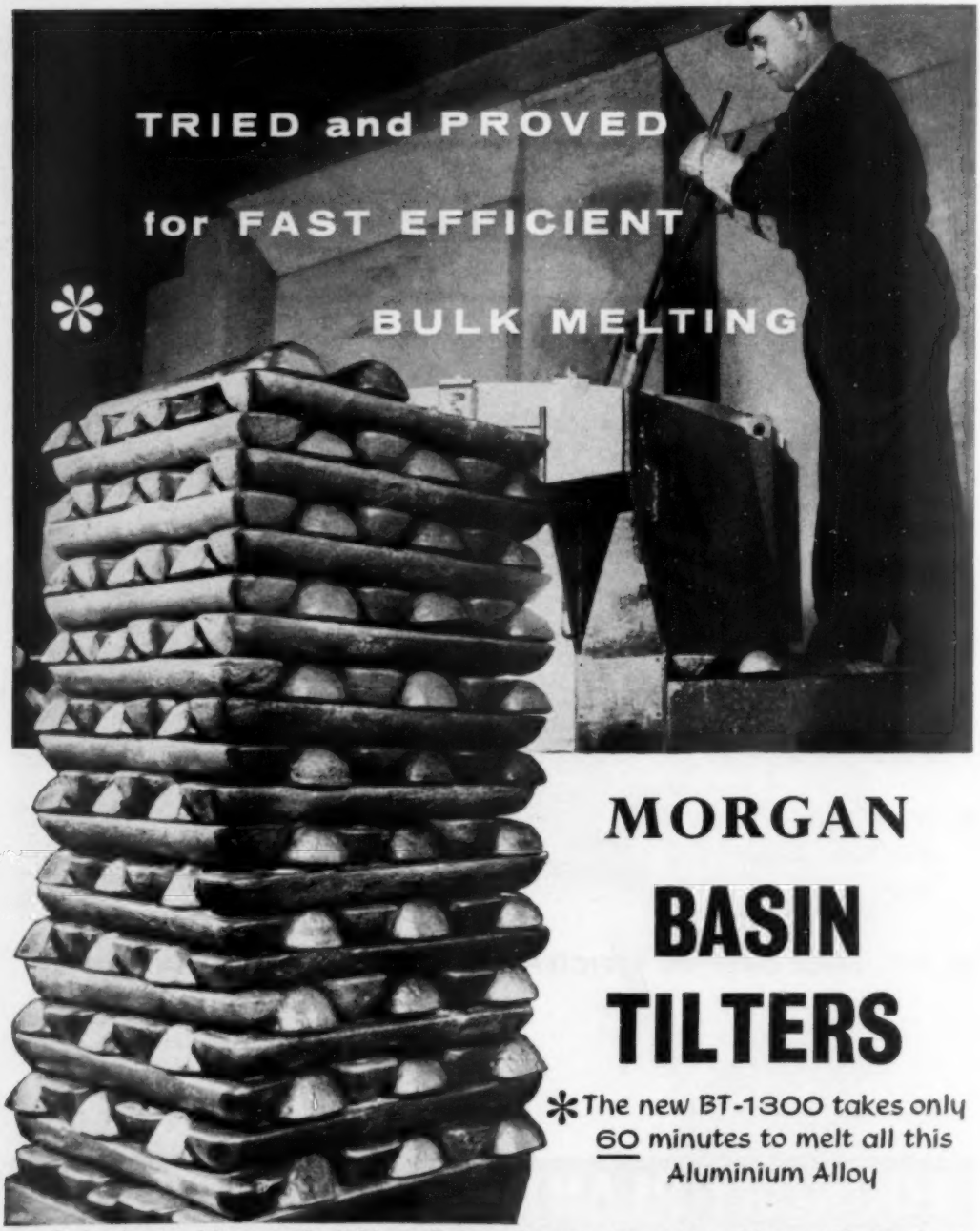

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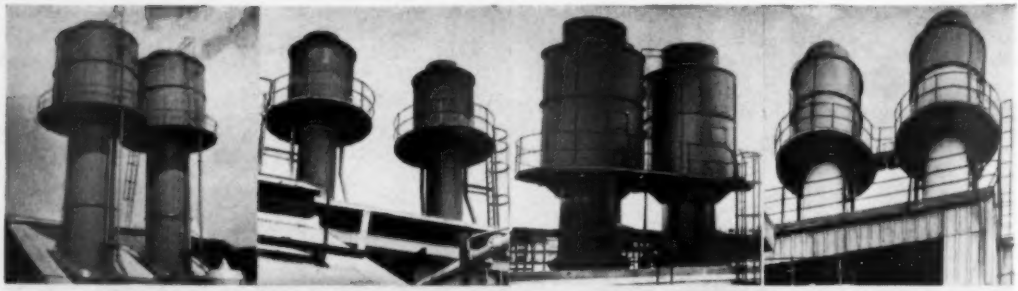

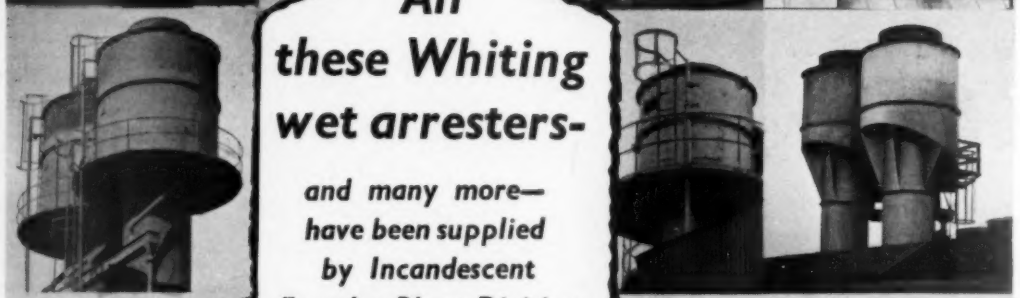

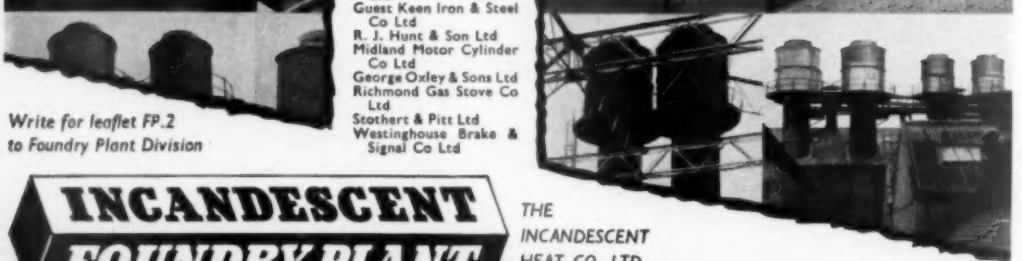

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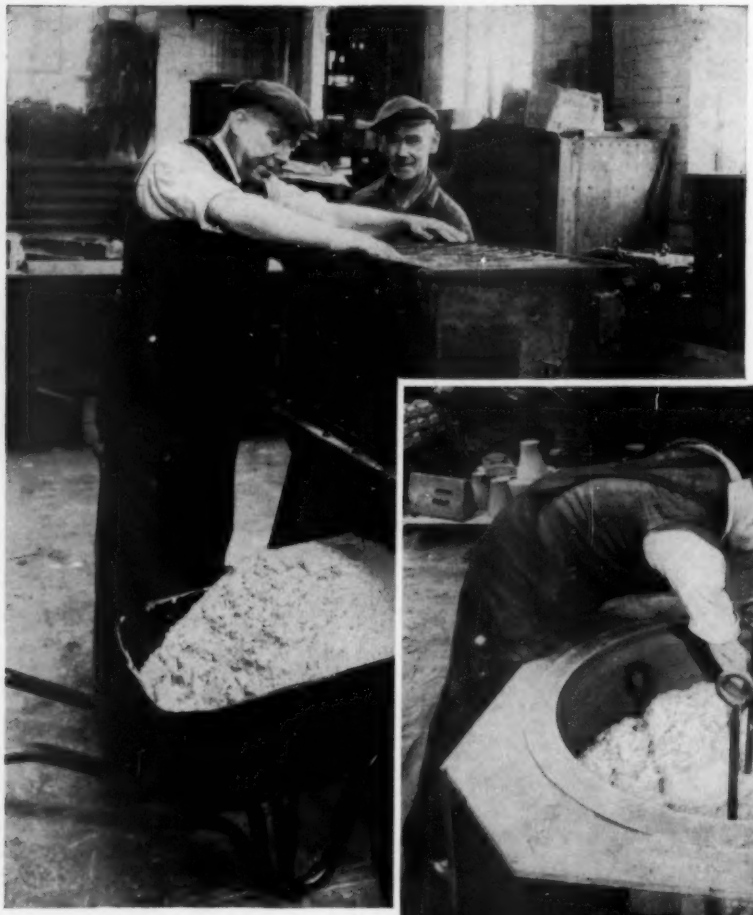

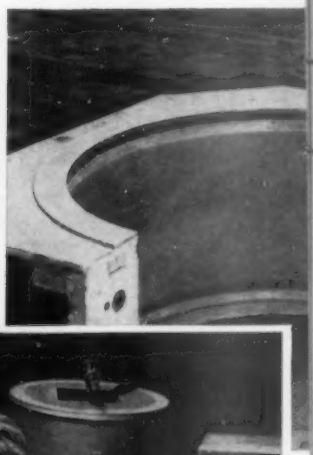

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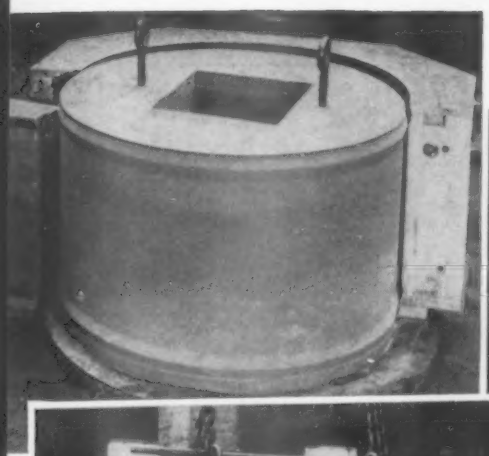

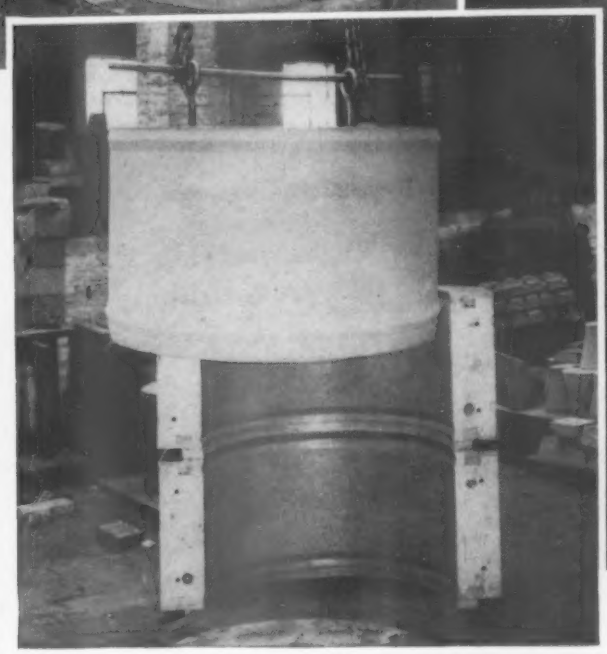

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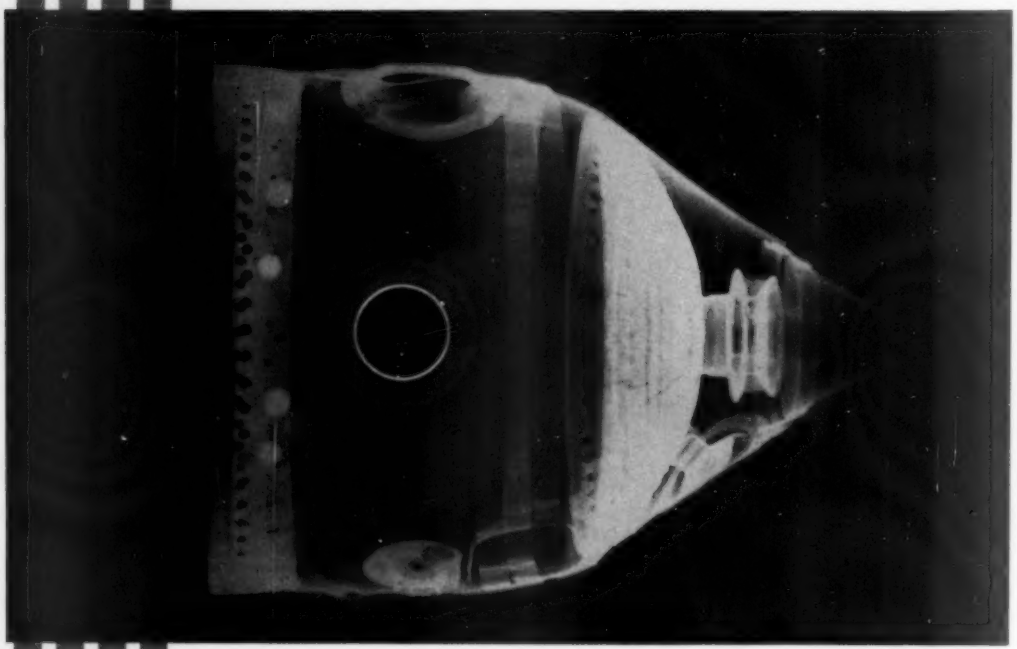

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FOUNDRY TRADE JOURNAL

Vol. 111 October 26, 1961 No. 2342

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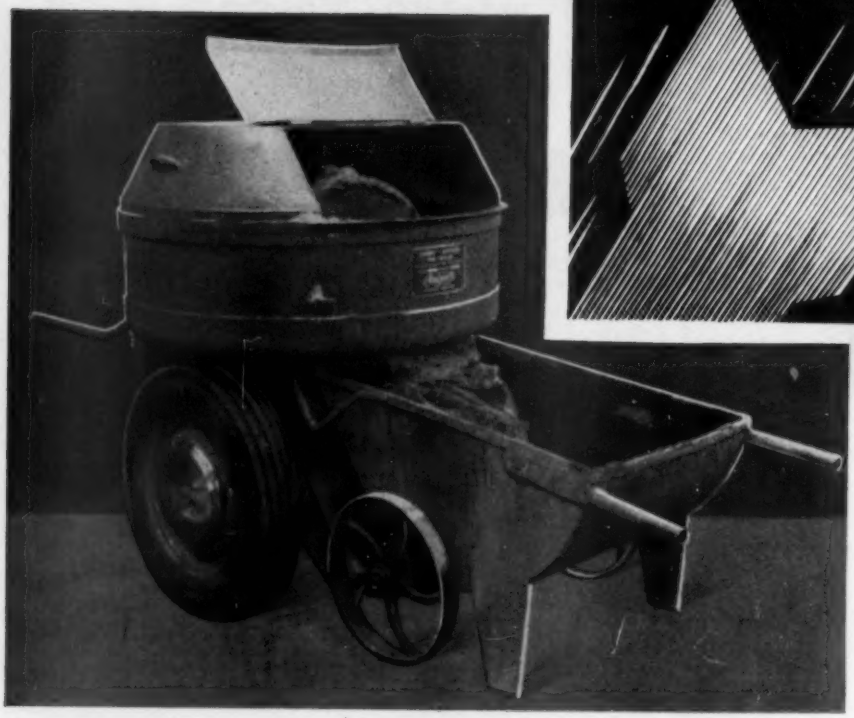

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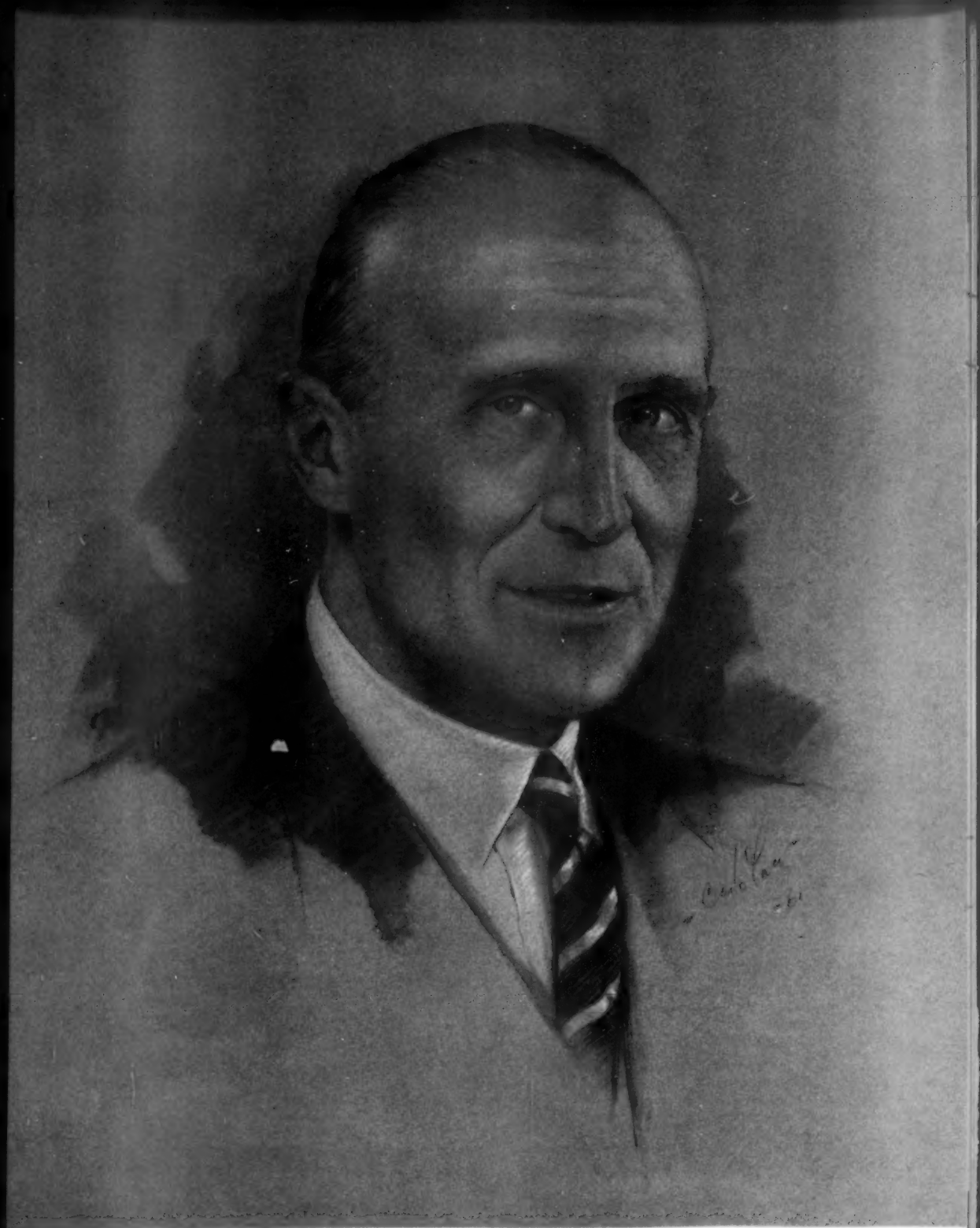
Vol. 111 October 26, 1961 No. 2342

Achievement of Practical Co-operation

Between the two wars, people whose business it was to supply an industry with its plant and raw materials were not always *persona grata* at meetings organized by their customers. This was to be deprecated, as means were found to introduce their goods by devious means, not meriting emulation. Yet members of the customers' organizations, when they in turn were selling their own products, had no hesitation in following similar practices. In recent years, however, it has been belatedly realized that if progress is to be made, there must be a free and open exchange of information between producers and their suppliers. Manufacturers can only supply the most efficient plant if they have the fullest information as to the conditions prevailing and the aspirations of the purchaser towards future developments.

An early example of this progressive outlook was set by the Iron and Steel Institute, when 43 years' ago, it created an Iron and Steel Engineers Group, which has had a profound and beneficial influence on the modernization of the industry which it serves. Several research associations now have grades of membership for the participation of equipment and supply firms. In particular, the British Steel Castings Research Association's conference this week is being devoted to the development of the industry's plant and to this a number of leading makers have been invited. The British Cast Iron Research Association has formed a new committee specially to study the plant requirements of the industry and there are to be representatives on it from the membership of the Foundry Trades' Equipment and Supplies Association.

The latest effort to secure similar co-operation is being launched by the Association of Bronze and Brass Founders, by the creation of a new grade of membership. It is here that a joint effort is most desirable, as historically, the conditions have not been favourable for the best " tooling-up " of non-ferrous foundries. Primarily, changes in the prices of raw materials can so alter manufacturing costs that the latter seemed to be of less importance. On the other hand, iron and steel founders were the big customers of the equipment makers and hence designers amongst the latter gave their requirements priority. Non-ferrous founders are now insistent that their major requirement is for a smaller range of efficient plant designed especially for their needs. Familiarity with London area meetings of the ABBF gives us confidence that those joining the new class of membership will find a genial atmosphere in the Association and forthright comment which suppliers of plant and materials cannot fail to appreciate and profit from.



W. S. SCOTT, M.A. (Cantab.).

Chairman of Council of the British Steel Castings Research Association and Managing Director, Darlington Forge, Limited

Featuring . . . .

MR. W. S. SCOTT

At the annual conference of the British Steel Castings Research Association, which is being held on Thursday and Friday of this week in Harrogate, Mr. W. S. Scott, M.A.(CANTAB), will preside for the first time. He has recently succeeded Dr. R. Hunter as chairman of the BSCRA Council (of which he was lately vice-chairman) after being a member of Council since July, 1956. Born in West Hartlepool and educated at Haileybury College, from which he gained an Open Scholarship in mathematics to Clare College, Cambridge, in 1924, he took first-class honours in the Mathematical Tripos Part I in the following year, and second-class (grade I) honours in the Mechanical Sciences Tripos in 1927.

Mr. Scott joined Vickers, Limited, Sheffield (now the English Steel Corporation, Limited) in 1927, and, after four years' training in their Sheffield works, became manager, first of the gun-treatment and then of the armour departments. As a result of these appointments he became directly connected with the rearmament programme before the second world war, and was in charge of the production of armour for the King George V class of battleships, cruisers, and aircraft carriers, in addition to that for tanks. In 1945, Mr. Scott was appointed superintendent of the Darlington Forge, Limited, one of the E.S.C. group of companies. In the following year, he was made a special director; he became a full director in 1948, and has been managing director since 1955.

A vice-president of the North-East Coast Engineering Employers' Association (having been a member of its Standing Committee since 1945), Mr. Scott is also a member of the Institute of British Foundrymen and of the North-East Coast Institution of Engineers and Shipbuilders. He is chairman of the North-East Regional Technical Committee of the British Steel Founders' Association, and a member of that Association's clean air committee. Amongst his civic activities, Mr. Scott is a member of the Darlington Rural District Council.

In his early years, he played full back for Cambridge University at Rugby football, but now confines spare-time activities to rough shooting, gardening and an occasional game of golf.

Liverymen's Visit to Belgium

This year's tour in Belgium of Liverymen of the Worshipful Company of Founders was the first occasion to take them outside the United Kingdom and it therefore turned over a new page in the Company's long history. The trip proved to be a notable success and was much enjoyed by the 20 members of the Livery who participated. The party left London in the evening; it was met in Brussels by a representative of the Belgian Office for Foreign Trade and a motor-coach was placed at the party's disposal throughout the tour.

Works Visits

Next morning, the party visited the Henricot works at Court-St-Etienne, one of the oldest and largest steel foundries in Europe, having been founded by the present chairman's grandfather. Throughout their long history, the foundries have been renowned for the quality of the castings produced and the efficiency of their production and it was learned that 85 per cent. of their yearly production of some 25,000 tons of steel castings at peak were exported. By far the larger part of the company's steel castings are sent out in the partially- or finished-machined condition and a substantial proportion of the output consists of alloy-steel castings. Members of the Livery were most impressed with the company's recently-built laboratory-block which embodies a pilot foundry. After being entertained to luncheon by the Belgian Office for Foreign Trade, the party then visited the Chateau of Beloeil, the ancestral home of the Princes de Ligne. Although the original Chateau was destroyed by fire early this century, it still contains a fine library of old books and some magnificent painted Books of Hours.

The morning of the third day was spent touring the extensive Cockerill plant near Liège, founded by a Scotsman shortly after the Battle of Waterloo. Most of the party's limited time was spent in the foundries, which cater chiefly for large castings in both iron and steel. The biggest part of the foundry's production is devoted to iron castings, chiefly ingot moulds, but the visitors also saw some fine examples of skilled moulding practice for large diesel-engine work. Apart from bogie castings for their own locomotives, the company make some very fine steel castings for a variety of uses and are fortunate in having local and cheap supplies of natural-bonded moulding sands. A short tour was made also of the company's locomotive shops and the party was impressed with the modern design of their diesel-engined locomotives and the excellence of the machine-tools.

Functions

On returning to Brussels that evening, the party were guests at a cocktail party given in their honour by M. F. Cattoir, president of the Belgian Chamber of Commerce in London, and attended also by Sir John Nicholls, the British Ambassador. Later that evening, members of the Livery entertained their Belgian hosts to dinner, guests being Mr. Verboomen (director at the Belgian Office for Foreign Trade), Baron de Gerlache de Gomery, Mr. Cattoir, Mr. Monfils, Mr. Jacques Henricot, Mr. de Keyser (director of Fabrimetal), Mr. Dewez (managing director at Henricot), and Mr. Goffart (engineering manager at Cockerills).

After visiting the battlefield of Waterloo on the following morning, the party dispersed for home, and all agreed it had been a most interesting and enjoyable tour.

Forthcoming Events

OCTOBER 30

Institution of Mechanical Engineers

Thermodynamics and Fluid Mechanics group:—Discussion on the "Extent to which Data can be made Available for Engineering Design," 6 p.m., at 1, Birdcage Walk, Westminster, London, S.W.1.

NOVEMBER 1

Manchester Metallurgical Society

"Problems Associated with the Welding of Heavy Sections," by A. F. Gifford, 7.15 p.m., at the headquarters of the Manchester Literary and Philosophical Society, George Street, Manchester.

Institute of British Foundrymen

North-east Lancashire section:—"Mould Drying by Pressure," by B. Malone, 7.30 p.m., at the Accrington College of Further Education.

Institute of Vitreous Enamellers

Southern section:—A panel comprising Mr. S. W. Barkhouse, Mr. W. G. Brown, Mr. T. J. McArthur and Mr. J. I. Scott will answer questions on the "Problems of Enamelling," 7.15 p.m., at the Constitutional Club, Northumberland Avenue, London, W.C.2.

NOVEMBER 2

Institute of Metals

London local section:—"Design of Strong Materials," by A. H. Cottrell, 7 p.m., at the Royal School of Mines, London, S.W.7.

Institute of British Foundrymen

Stoke-on-Trent section:—"Cast Aluminium-alloy Crank-cases for the Deltic Engine," by R. W. Eade and K. Evans, 7.30 p.m., at the Stipendiary Court Room, Hanley Town Hall.

NOVEMBER 3

Institute of British Foundrymen

East Anglian section:—Dinner and social evening, 7 p.m., at the Oriental Cafe, Westgate Street, Ipswich.

Birmingham branch:—"Men Only" dinner at the Ward Arms Hotel, Dudley.

NOVEMBER 4

Institute of British Foundrymen

West Riding of Yorkshire branch:—"Production of High-duty Iron Castings," by L. Clarke, 6.30 p.m., at the Bradford Institute of Technology.

1961 Sheffield Foundry Exhibition

The 1961 Exhibition of materials, furnaces and equipment for the steel, iron and non-ferrous foundry industries, organized jointly by the Sheffield Foundry Trade Technical Society and the Sheffield and district branch of the Institute of British Foundrymen, is to be held from November 7 to 10 at Somme Barracks, Glossop Road, Sheffield. The Exhibition will be formally opened by the Lord Mayor of Sheffield at 2.0 p.m. on November 7, who will then make a tour of all the stands. Admission is free to the Exhibition and it will be open from 2.0 p.m. to 9.0 p.m. each day. The objective of the Show is to tell the story of technical progress, research and new developments and to bring the makers of new industrial equipment into direct contact with the firms and workers who use them. To date, no fewer than 30 manufacturers of foundry equipment and supplies have announced that they will be exhibiting. (Details of stands will be covered in a later issue of the JOURNAL.)

SAMUEL OSBORN & COMPANY, LIMITED, Sheffield, are supplying the stainless steel for a £2,000,000 rayon-production plant being constructed by Courtaulds, Limited, for Poland. The Sheffield firm is also supplying similar steel for plants of this kind for Russia, France and Yugoslavia.

Heat-treatment of Hypo-eutectoid Steel Castings

By F. Johnson.

Throughout the steelfoundry industry today it is the established practice to provide heat-treatment, in its various forms, to steel castings prior to their introduction to service applications. This has enormously improved quality-control over the untreated castings of the early part of the century, and extended the range of their service use to a wider field of engineering. Theory and practice in metallurgy are very intimately related, with the problems of production invariably dictating the lines of research with the onus resting on the shoulders of the metallurgist to answer the practical man's questions. The objective of this article is to consider the routine heat-treatments necessary to improve the mechanical and machining properties of straight-carbon steels and to relate this improvement to the simple underlying structural changes that accompany it.

Heat-treatment of steel can best be defined as the deliberate subjection of a metal to thermal-treatment cycles of known duration followed by controlled-cooling rates. The intention of this is to produce a permanent structural change to improve the mechanical or physical properties of the metal without intentionally affecting its chemical composition. In its broadest interpretation it is considered that heat-treatment of steel is confined to the heating and cooling of components. This may include annealing in its various

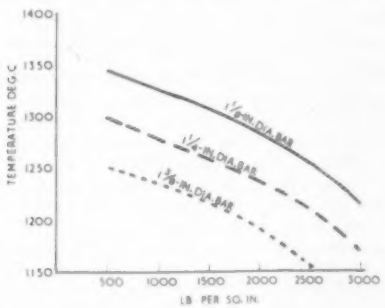


FIG. 1.—*Graph indicating tensile strength of hypo-eutectoid steel at elevated temperatures* (0.27 *per cent. carbon*).

forms, normalizing, and also quenching and tempering in different media. Specific temperatures under controlled conditions of thermal arrest and descent are of use to steel-casting producers for the following reasons:—(1) To effect the permanent release of undesirable internal stresses and strains, arising from the casting process; (2) to bring about forcibly the re-arrangement of the as-cast phase structure which exists in a coarse condition, thus refining the grain size to a state completely divorced from that initially existing in the casting within the mould; (3) to confer by a combination of thermal treatments the most-precise mechanical properties obtainable for the existing chemical composition; (4) to satisfy the temper demanded by the machine tool. Since specifications embrace a complex multitude of compositions it is necessary for different steels to receive individual attention. The science of heat-treatment is specialized and whilst, to the layman, it may appear to be an incidental there is involved the quality of the casting with its attendant ability to withstand service conditions. It does not merely suffice to introduce a component to red heat conditions for a period based on "guess-ology" or to temper it at temperatures based on rule-of-thumb methods. The constant demand for castings to specifications calls loudly for instrumentation, controlled furnace-practice and atmosphere, in conjunction with a basic knowledge of metallurgical technique.

Stress Relief and Annealing

On cooling within the mould dimensional changes take place in the casting primarily governed by its contour and section thicknesses. As temperature reduction progresses from the fully-molten condition, solidification begins. In this condition the casting displays characteristics of weakness with very-low ductility properties (Fig. 1). Factors which produce restricted directional contraction will be, the existing hot-strength of both the core and mould. Should this exceed that of the metal itself the consequence may be hot-tearing, since the metal is unable to deform without the crystals being divorced along a path following that of the liquid films. It is established that this defect occurs when conditions of elasticity have not been fully established. With solidification complete plastic deformation will occur, but the presence of internal stress will be subdued by the attendant process of creep and yield until the casting is at black heat. With further reduction of temperature the mechanical properties increase

Heat-treatment of Hypo-eutectoid Steel Castings

with tensile and compressive forces being created where extreme section changes occur. Thin sections will quickly set up conditions of rigidity with initial tensile stresses resisting contraction by heavier sections. Subsequent cooling to room temperature will suggest that thin sections then exist in compression whilst thicker sections exhibit tensile stresses (Fig. 2). The magnitude of these stresses will be proportional to the temperature of the sections at the time of initial stress formation.

If the effect of such stresses is considered, it is clear that there exist opposing forces of "pull" and "push" which, if allowed to remain unbalanced would result in the casting exhibiting hot tears, distortion and warpage. Externally the component might appear perfectly sound when introduced to the fettling shop for removal of gates and risers. The effect of "cutting off" would, in some instances, remove the balance of stresses and visible signs of distortion or actual cracking will result. The cracks may pass unnoticed even to the most practised eye, but will open up to an alarming extent on heat-treatment.

Structural Change

Formerly, annealing in its broadest interpretation was employed by the older founders for internal-stress relief only, and a maximum temperature of 750 deg. C. was not uncommon. However, in order to obtain most benefit from the process, it is now more-common practice to elevate the temperature some 50 deg. C. above the upper Ac_3 value of the critical range (Fig. 3) and after a suitable period allow the component to cool in the same furnace. This has the twofold advantage of stress relief and anneal. Under rapid production conditions it is common practice to withdraw components at 300 deg. C. to facilitate quicker turn-round time.

The initial "as cast" structure consists of coarse pearlite grains which are enclosed by coarse ferrite envelopes constituting an acicular structure (Fig. 4). A distinctive characteristic is the geometrical regularity of the orientation of the ferrite and pearlite. In this condition the mechanical properties are not at their best for the existing composition. The casting is elevated to a temperature approximately 50 deg. C. above the upper critical point according to its chemical composition and allowed to soak one hour per one inch of section thickness. On cooling down from Ar_3 the solid-solution austenite deposits ferrite in the grain boundaries of the γ-iron solid solution. The affinity of the austenite for carbon brings about a state of eutectoid concentration and at Ar_1 the existing solid solution of austenite containing slightly less than 0.9 per cent. carbon breaks down into pearlite in a groundmass of ferrite. In furnace cooling the nature of the pearlite is coarsely lamellar (Fig. 5). Annealed steels containing less than 0.9 per cent. of carbon as hypo-eutectoid consist of pearlite and ferrite whilst carbon in excess of 0.9 per cent. as hyper-eutectoid consist of pearlite and cementite. The temperature drop at which transformation of austenite takes place will have a direct effect on the final mechanical properties and microstructure of the casting. A rapid reduction of temperature will result in a marked lowering of the critical temperature since inadequate time would hinder

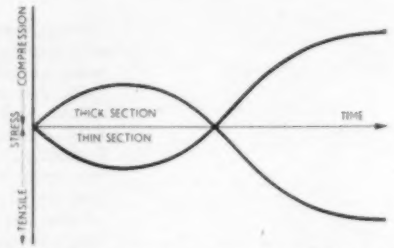


FIG. 2.—*Sketch showing changing relationship of the internal stresses of unequal sections on cooling.*

the commencement and progress of the transformation. With industrial annealing it generally happens that conditions of equilibrium exist so that austenite transforms to ferrite and pearlite in hypo-eutectoid steel castings.

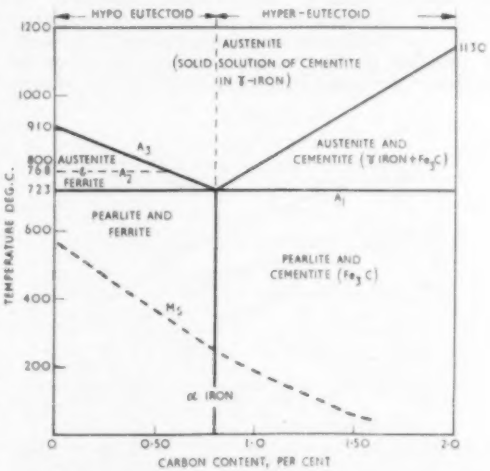


FIG. 3.—*Simplified version of part of the iron/carbon constitutional diagram, indicating also the equilibrium conditions for the formation of martensite (M_s) with suitable heat-treatment.*

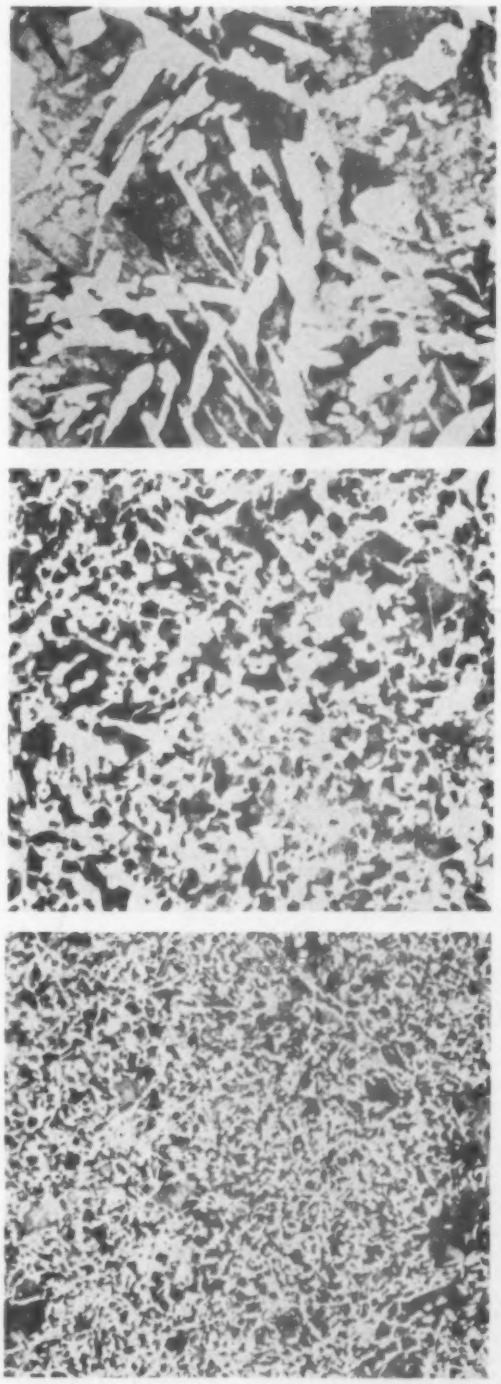
Normalizing

This process is often confused with that of annealing, probably because it entails basically a heating and cooling action only. The essential difference is that although the casting is heated within the furnace it is withdrawn after a suitable permeating period and cooled in normal atmo-

spheric "still" air. The arguments which arise from the interpretation of "still" air can be many, but for most practical purposes the castings are withdrawn from the furnace at temperature and left to cool on the shop floor away from cold draughts. The result of treating the casting in this manner will generally confer the mechanical properties required for the existing chemical composition. Particularly, the yield and ultimate tensile strength will be far superior to the values arising from the annealing of the same casting. Better resistance to impact is yet another important feature in conjunction with the essential refinement of grain structure.

Structural Changes

The factor of immediate importance will be the speed at which the casting cools through the critical range. When the casting cools down from normalizing temperature, it suffers an arrest at the plane Ar_3; with the evolution of heat the solid solution of austenite proceeds to deposit the excess ferrite (α-iron) in the non-magnetic β condition. Initial deposition of ferrite occurs in the grain boundaries of the γ-iron solid solution. This will continue to a point where all the excess ferrite has been discarded around patches of austenite. By gradual deposition a network of ferrite develops at each grain boundary, and the affinity of austenite for carbon eventually produces a state of final eutectoid concentration. This is because the solid solution which occurs in the enclosed network takes up the carbon and becomes richer, whilst more ferrite is deposited as the temperature falls. On reaching Ar_1 the existing solid solution of austenite containing slightly less than 0.9 per cent. carbon breaks down into pearlite, the eutectoid mixture of ferrite and cementite as α-iron and iron carbide respectively. The faster the controlled rate of air-cooling the tighter becomes the lamellar pearlite in the form of thin plates. Also rapid still-air cooling from Ar_3 to Ar_1 is such that ferrite is arrested in its growth producing smaller grains than occur with annealing (Fig. 6). The arrest point of Ar_3 will, of course, vary with the relative chemical composition of the steel. With increasing carbon content the point of arrest will occur at a lower temperature according to the position on the iron/carbon constitutional diagram. The eutectoid composition phase relative to arrest point Ar_1 normally occurs



FIGS. 4, 5, AND 6.—*Micro-structures of hypo-eutectoid steel specimens of composition—C—0.27 per cent., Si—0.4 per cent., S—0.02 per cent., P—0.02 per cent. (Top) As-cast, showing the acicular structure of coarse pearlite in coarse envelopes of ferrite; (centre) annealed—2 hrs. at 880 deg. C. and furnace cooled—note coarse lamellar pearlite in a ground mass of ferrite; (bottom) normalized—2 hrs. at 880 deg. C. and air cooled. Smaller grains of ferrite and tighter lamellar formation of pearlite in thin plates is achieved. Etched in 2 per cent. Nital, ×100.*

at the same temperature for general carbon steel. It is impossible to recommend temperatures to suit all foundries, but in the Author's particular case it normally suffices to elevate castings to 900 to 920 deg. C., and after a one-hour-per-inch-section soak, to air cool.

Quenching

Plain-carbon steel castings are not generally subject to quenching and tempering conditions unless specific requirements demand improved structure and mechanical properties. The variation in section of most cast components creates tremendous difficulties with regard to uniform rapid heat extraction, and often results in cracking or distortion. Obviously the inexperienced "treater" should approach the process with extreme caution and study the elementary principles otherwise the cost of his experience will be expensive.

Initially, it will require study of the casting mass section with particular reference to tearing, cracking and distortion. There is a distinctly-steeper temperature gradient for thinner sections than for heavy sections, and the quenching medium and rate of temperature drop will call for experience (Fig. 7). It is essential to be fully aware of the choice of maximum temperature, period of time prior to quench, speed of quench and the final properties for which the engineer is attempting to achieve temper. In particular the chilling action of water on the external surface of the casting, is extremely vicious, producing a distinct structural transformation of variable-plane intensity from core to surface. The transitional imperfection from neighbouring structures, induces severe internal opposed stresses, and with extreme change in section will often produce distortion or cracking. Martensite commences its formation at the approximate temperature indicated by the line Ms superimposed on the simplified diagram Fig. 3 and again on Fig. 8. In any given steel the temperature value at which transformation of martensite is complete, is recognized as the Mf point. This may exist below the Ms point relative to the carbon content of the steel, and usually the smaller the Ms to Mf gap, then the higher the Ms point. In practice every attempt is made to quench steel castings to the fully-martensite condition in the quest for super mechanical properties as tempered. The product of quench, however, quite often produces the martensite/bainite structure with the further possibility of complete bainite. The casting must be raised to a temperature in excess of the Ac_3, care being taken to avoid austenite-grain growth. For practical purposes dependent on composition, the temperature is taken to 30 deg. C. above the Ac_3 value and slightly higher for lower carbon contents. Quenching is carried out in water or oil of known temperature, with preference being given towards oil for the higher-carbon hypo-eutectoid steels. Where martensite is produced the hardest constituent of a heat-treatable steel has been formed. The allotropic change γ- to α-iron has been completed with the carbide in a highly dispersed condition almost akin to austenite, but the structure is tetragonal as α martensite.

Considering bainite we find the acicular structure of lower bainite is a product of slightly-more retarded cooling than is required to form martensite, whilst upper bainite is a product forming with cooling rates faster than would produce pearlite. The carbide particles are arranged in a ferrite

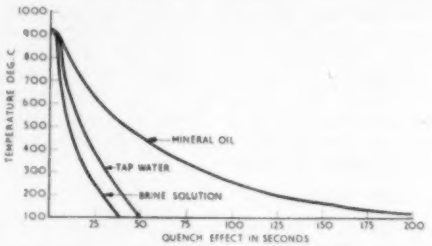


FIG. 7.—*Curves demonstrating the relative cooling effect of various quenching media drawn up for a cast bush component* (1½-*in. o.d. by* 1-*in. i.d. by* 2¼ *in.*) *of carbon content* 0.3 *per cent.*

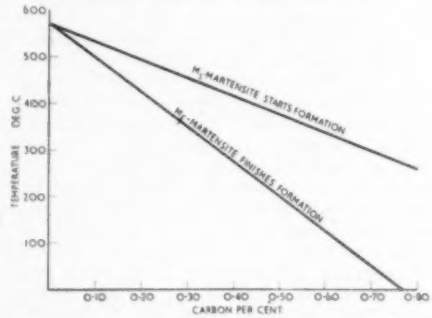
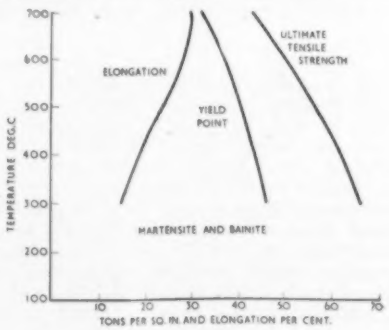


FIG. 8.—*Relationship between carbon content and the temperature range of the start and finish of the martensite phase.*

FIG. 9.—*Varying physical properties of a cast steel* (0.43 *per cent C*) *bar,* 1-*in. dia., water quenched from* 880 *deg. C. and tempered over a range of temperatures with a* 30-*min. soak.*



matrix, and the resemblance of lower bainite to martensite is remarkably close. Castings introduced to a quenching medium should be removed within the temperature range 150 to 200 deg. C. and placed in the tempering furnace.

Tempering

The steel casting as fully quenched will be both hard and brittle, and in no practical condition to be introduced to normal service conditions. The quenching stresses if allowed to persist in sensitive areas will develop incipient cracks possibly to stress fracture. It is therefore necessary to follow up with temper treatment before the casting falls below 150 deg. C., and the furnace should be at the required temperature. This obviously depends entirely on the steel composition and the properties of hardness, toughness and ductility intended, but will not exceed the Ac_1 point value (Fig. 9). If the casting does pass beyond Ac_1 the purpose of quenching and tempering has lost its essential value since the properties of the casting will be dictated by the conditions of temperature drop through the Ar_1 transformation level. Also, it is bad tempering practice to approach too near the Ac_1 point where the resulting structure will provide lower elastic limits, yield points and impact values with general falling off in mechanical properties.

Structural Changes

Before considering the temperatue range, it is useful to consider the transformation of the α-martensite. The carbon is in a state of supersaturated solution in α-iron, and with rise in temperature will adopt a more stable β-martensite structure with body-centred cubic ferrite. This condition of ferrite and iron carbide will be influenced by further rise in temperature, and time factor creating an increase in carbide granule size. With prolonged heating at temperatures close to Ac_1, the carbide diffuses, coalesces and creates large particles of spherical form. Consideration must of course be given to the improbability of a fully-martensite casting structure and the possibility of constituents formed if failure to succeed Ar_3 was allowed prior to quench.

There is little visible change of micro-structure on tempering below 200 deg. C., and the softening effect is almost negligible, although stress relief is experienced. Elevation of temperature to 500 deg. C. will reduce hardness since the carbide condition has now been effected (Fig. 10).

When the desired heat condition has been reached by the casting, it is wise to allow at least 2-hr.-per-in.-of-section soak prior to cooling. Frequent use is often made of the characteristic temper-colour phenomena caused by the effect of heat on the oxide film at the casting surface. This effect will only be visible with clean brightly ground surfaces and will depend also on the chemical composition of the steel. Under normal conditions the following colour changes will occur:—Pale yellow at 220 deg. C.; straw yellow at 230 deg. C.; gold at 240 deg. C.; brown at 255 deg. C.; brown-purple at 265 deg. C., purple at 280 deg. C.; pale blue at 290 deg. C., and dark intense blue at 315 deg. C. It must be appreciated that imperfect lighting conditions within the department considerably effects the interpretation of tempering colours. In addition, the colour of the surface oxides are influenced by the period of soaking time and furnace atmosphere. It is, therefore, inadvisable to accept the oxide-tint phenomenon as the controlling factor, and its chief practical asset is that of a guide.

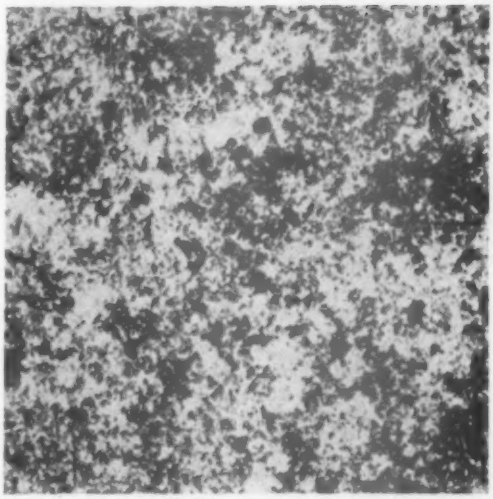


FIG. 10.—*Micro-structure of quenched and tempered hypo-eutectoid steel specimen—for composition refer Figs.* 4, 5, 6—*subjected to the following heat-treatment:—*2 *hrs. at* 880 *deg. C. and furnace cooled, followed by* 2 *hrs. at* 870 *deg. C. and water quenched, then tempered for* 2 *hrs. at* 650 *deg. C. Etched in* 2 *per cent. Nital.* ×100.

Conclusion

Detailed consideration of the merits of heat-treatment are beyond the scope of this short paper. General rules can and must be observed in relation to temperature control, particularly to critical points. Under conditions of annealing, normalizing and tempering it is imperative that components be elevated to the desired temperature over a reasonable period of time. With extremely-rapid rise in temperature above Ac_1, transformation of pearlite to eutectoid austenite will occur. The primary ferrite thus remains unabsorbed and continued rapid elevation of temperature will cause transformation of α-ferrite at approximately 820 deg. C. to γ-iron. Here there will be conditions of austenite as γ-iron almost carbon free in conjunction with austenite of approximately 0.83 per cent. carbon. The steel will therefore display intermingled crystals of the two types. In order to unite and create a state of absorption of the two phases, it will be necessary to extend the soaking period within the upper critical-transformation

point to produce conventional characteristic austenite. Phasial changes in the solid condition are related to the adoption of specific critical-point values which by their characteristics will provide the desired mechanical properties. Excessive elevation of temperature above the Ac_3 point during annealing will produce grain growth with its undesirable attributes, normalizing will to some extent restore the smaller-grain structure dependent upon the magnitude of the initial overheating. Where the temperature approaches the solidus plane incipient melting will permanently effect and impair the casting and create oxide inclusions at the grain boundaries. Subsequent heat-treatment technique however performed will not provide an antidote to such conditions, and the coarse-grain structure will persist. The element of time at the soaking temperature is important, particularly when mass sections extend over a wide range. It is obvious that discretion must be exercised, and even extremely-heavy sections should never exceed 12 hours duration above Ac_3. Quenching practice will be influenced by the chemical and physical characteristics of the liquid medium and is a function of specific heat, thermal conductivity and temperature of introduction of the casting. Respect for the power of coolants is imperative, and their ability to promote incipient cracks, which gradually extend to create rupture, cannot be overlooked. Conversely they can, under controlled conditions, provide the required microstructure, which, on subsequent temper, exhibits a combination of unique mechanical properties.

Finally, in practice avoid the temptation of visible control by the "red-glow rule," and at all times adopt instrumentation of the highest order. Failure to observe such advice is a retrograde step, and components may well be irretrievably ruined.

Latest Foundry Statistics

Ironfounding: According to the Council of Ironfoundry Associations there were 129,736 people employed in the UK ironfounding industry during the week ending July 29. This is 925 fewer than the previous month, and 143 fewer than a year ago.

Copper-base Castings: The monthly *Bulletin* of the British Bureau of Non-Ferrous Metal Statistics reports that the output of copper-base castings during August was 6,005 tons. Production for the first eight months of this year was 55,854 tons as against 57,210 tons for the corresponding period of 1960.

Steel Castings: In *Monthly Statistics*, published jointly by the Iron and Steel Board and the British Iron and Steel Federation, the weekly average output of steel castings during August is estimated to be 4,200 tons; in July it was 5,500 tons, and in August, 1960, 5,000 tons. When a count was made on August 5, the steelfounding industry was employing 18,410 people, 240 fewer than a month earlier, but 490 more than a year ago.

Correspondence

BRAKE-DRUM PROBLEM

To the Editor of the FOUNDRY TRADE JOURNAL

SIR,—Correspondence printed* regarding my brake-drum problem is most helpful and the comments interesting and educative. At present, we are dealing with the problem in two directions—(i) by avoiding the soft cod in the drag mould as suggested by Mr. A. D. Morgan (BCIRA), and also (ii) by avoiding inoculation of the metal by ferro-silicon (and also weighting the cope to avoid any possibility of lift).

We are also weighing all the castings and keeping a record of the variation in weight. Already it has been found that it is possible to have 90 per cent. of the castings within a certain range of weight by adopting these methods. Previously the weight range of castings was too high but now it has been reduced.

Unfortunately, however, due to unavoidable circumstances, machining of these castings has not been completed in the machine-shop, and therefore, the final results of these experiments are not forthcoming immediately. In the meanwhile, we have machined a number of castings in our own foundry and find that so far as we can see, the porosity does not occur in castings of lowest weight. It may take some time before all the experimental castings are taken up for machining, and only then will we be able to learn the full results.

We are grateful to you for publishing our difficulties in the JOURNAL, and thank all the foundrymen who have been good enough to express their views in this matter.—Yours, etc.

"DRUMMER."

* Replies printed in JOURNALS of October 5, 12 and 19 to the original letter of "Drummer" which appeared in the issue of September 21.

ACOUSTIC CUPOLAS

To the Editor of the FOUNDRY TRADE JOURNAL

SIR,—Your leading article on noise (JOURNAL, September 21) (which will have done useful service if it directs attention to the benefits derived from the suppression of unnecessary noise) mentions the cupola in its unusual and unwelcome rôle as a reverberatory furnace. From conversations the writer has had with a few of your readers, it seems that there is a multitude of explanations for this phenomenon and many different impressions of the effects. Contralto, basso-profundo and other—harsh and non-musical!—terms have been used to describe these effects, which apparently extend into the ultrasonic range with little provocation, so that sound gives way to vibration, which may be transmitted a mile or more from the offending plant. Fan-belt slippage, off-balance fan blades, loose butterfly valves, percussion effects in the melting zone, sympathetic vibration of the air in the shaft—all these have been mentioned as possible causes. Stopping up the top row of tuyeres and insertion of diaphragms of different diameters in the air inlet have been tried as remedies, with varying degrees of success. One theory takes account of the density of the charge, an open charge tending to encourage the organ-like generation of sounds which distress rather than entertain the local inhabitants.

No doubt the problem has a comical side; but the ironfounder who has to solve the mystery of a singing cupola must find it even more of a headache than the folk who complain about it.—Yours, etc.,

"D. E. CIBEL."

October 16, 1961.

(Name and address supplied—EDITOR.)

Effect of Alloy Additions on the Properties of Ductile* Iron

By R. E. Savage

The modification of the structure of grey iron to produce s.g.-iron greatly expanded the field of application of the foundry industry's most-widely-used material. The progressive development of casting processes and materials is an index of the vigour with which the industry is meeting the commercial and technological pressures of the times. With the introduction of other materials in varying amounts into s.g.-iron there has been made available to the cast product a new and attractive range of mechanical properties and these are described in the following article together with the technique of alloying.

In presenting his paper at the first ductile-iron section meeting of the Gray Iron Founders' Society at the Case Institute of Technology, Cleveland, last June 6, Mr. Savage said that ductile iron was truly a material of the present, with a future. The material had provided progressive grey-iron foundries with an opportunity of reversing the downward trend of grey-iron consumption by giving the customer, when required, an iron with many properties far superior to those available in ordinary cast iron. Alloying of ductile iron was as important to the ironfoundry industry as alloying of wrought steel was to the steel industry and, he added, the higher-alloyed austenitic ductile irons provided a heat- and corrosion-resistant type of material. The primary objective of his paper, he said, was to explore some of the potentialities which alloying provided in ductile iron, thereby providing foundries with a material capable of expanding their marketing opportunities.

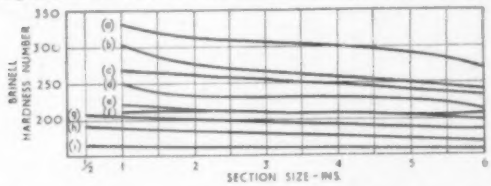
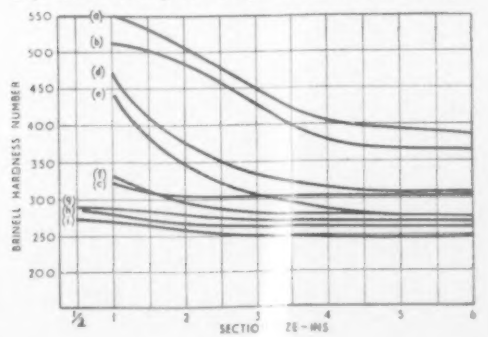


FIG. 1.—*Effect of alloying elements on hardness of as-cast ductile irons up to 6-in. section size.*

Key:—(*a*) 3¾ per cent. Ni, 0.55 per cent. Mo; (*b*) 3¾ per cent. Ni, 0.25 per cent. Mo; (*c*) 3¾ per cent. Ni; (*d*) 2 per cent. Ni, 0.55 per cent. Mo, 0.25 per cent. V; (*e*) 2 per cent. Ni, 0.55 per cent. Mo; (*f*) 2 per cent. Ni, 0.25 per cent. Mo; (*g*) 2 per cent. Ni; (*h*) 1 per cent. Ni; (*i*) unalloyed.

FIG. 2.—*Effect of alloying elements on hardness of normalized ductile irons in up to 6-in. section sizes.*

Key:—Letters correspond to compositions as in key for Fig. 1.



Alloys

Two types of alloyed ductile iron were discussed, low and high alloyed, the low-alloyed iron having nickel, molybdenum and vanadium present in amounts up to five per cent., and the high-alloyed material having nickel and chromium present from approximately 20 to 40 per cent. Mr. Savage then listed the reasons for alloying as follow: (1) Higher yield-strength for a given tensile strength; (2) higher tensile strength and yield strength in heavy-section ductile-iron castings; (3) better hardening characteristics, which permitted flame-hardening, induction-hardening and normalizing with minimum distortion and cracking; (4) ability to meet ASTM specifications for 36, 45 and 54 tons per sq. in. tensile strength consistently, especially for heavy sections; (5) ability to meet ASTM 60-45-15 specification consistently because of improved yield-strength; (6) improved wear-resistance for gears, cams, crankshafts and similar applications, and (7) high-alloyed austenitic ductile irons provided an alloy superior to any cast iron, unalloyed or low-alloyed ductile iron, for applications involving heat-resistance and/or corrosion-resistance.

Hardness

Fig. 1 illustrates the effect of alloying elements on hardness of as-cast ductile irons up to 6-in. section size, the Brinell hardness being used on the curve since it cou'd be related to the tensile strength, yield strength and elongation. Mr. Savage reported that the unalloyed ductile iron had a Brinell hardness of approximately 160 from ½- to 6-in. section size in the as-cast condition, but by adding nickel, molybdenum and vanadium in the amounts shown on the curve, the Brinell hardness could be pro-

* Alternative nomenclature for spheroidal-graphite or nodular iron. The Author is foundry manager, primary nickel department, International Nickel Company, New York.

gressively increased to 330 in the 1-in. section and to 280 in the 6-in. section, providing higher tensile and yield strengths.

Fig. 2 in the paper, he said, illustrated the effect of alloying elements on hardness of normalized ductile irons in up to 6-in. section size and the same trend as in Fig. 1 was evident here. The unalloyed ductile iron showed a Brinell hardness from 270 in ½-in. section to a lower value of 250 in 6-in. section. In all cases, the addition of nickel, molybdenum and vanadium had increased the Brinell hardness, providing higher tensile and yield strengths. By tempering the irons after normalizing treatment, lower Brinell-hardness values could be obtained. If the tempering temperature was sufficiently high and long, an annealing treatment was provided and a ferritic ductile iron was produced.

Tensile Strength

Tensile and yield strengths, elongations and impact strengths for as-cast, normalized and tempered ductile irons are plotted against the Brinell hardness in Fig. 3 and these tests, Mr. Savage explained, included a wide range of matrices—20 to 95 per cent. pearlite with ferrite, up to 90 per cent. bainite with pearlite and up to 35 per cent. martensite. The best combination of strength, ductility and toughness was shown in Fig. 3 by unalloyed irons or those containing only nickel as the alloy. The molybdenum-containing irons had higher yield strengths between 200 and 300 BHN, but lower ultimate strength, elongation and impact strength. This difference, he said, was associated with the small intergranular carbides in the molybdenum-containing irons. The carbide stabilizing tendency of molybdenum was strong and carbides had been encountered by other investigators even in high-silicon ductile irons alloyed with molybdenum.

Dealing with the strength/hardness relationship of ductile iron, Mr. Savage said this was sometimes expressed by the "K" factor, tensile strength divided by Brinell-hardness number. The unalloyed ductile irons and those containing 1 per cent. and 2 per cent. nickel had a higher average "K" factor (about 465) as compared with the overall average "K" factor of 430 for all nine compositions. The effect of tempering on the microstructures was to coarsen the acicular structures and to ferritize the pearlitic structures and he referred to Fig. 4 which, he said, showed the effects of one hour temper on normalized unalloyed ductile iron in various section-sizes, and it should be noted that these temperatures did not alter the Brinell number materially. Fig. 5, to which he next referred, showed the effect of one-hour temper on normalized 4 per cent. Ni, 0.6 per cent. Mo ductile iron in various section-sizes. In this case, he stressed that these temperatures altered the Brinell hardness materially and hence provided foundrymen with a convenient means of supplying the customer with a wide range of ductile irons by various tempering temperatures of an unalloyed ductile iron.

Hardenability

Passing on to hardenability of ductile irons. Mr. Savage first referred to Fig. 6 which showed the effect of nickel and molybdenum and he stressed that good hardenability was extremely important for improving wear-properties of gears, cams,

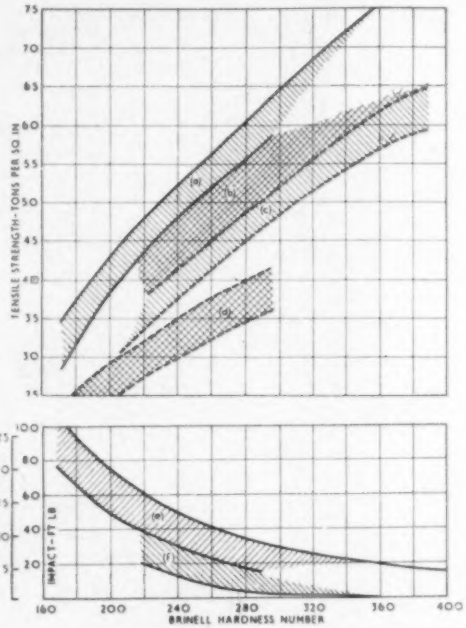


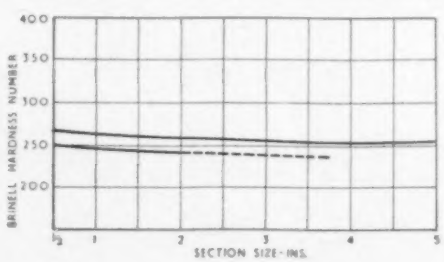
FIG. 3.—*Mechanical properties versus hardness of as-cast, normalized, and normalized and tempered ductile irons in 1-in. section size.*

Key:—(*a*) Tensile—Ni and unalloyed; (*b*) tensile—Ni/Mo; (*c*) Yield—Ni/Mo; (*d*) yield—Ni and unalloyed; (*e*) impact and elongation—Ni and unalloyed; (*f*) impact and elongation—Ni/Mo.

crankshafts and other heat-treated parts. By using alloys, he said, a foundryman could normalize a part to obtain the desired hardness—rather than oil-quenching—and hence minimize distor-

FIG. 4.—*Effect of one-hour temper on normalized unalloyed ductile irons in various section sizes.*

Key:—Upper line—normalized; Lower line—620 deg. C. temper.



tion and cracking. Nickel tended to graphitize carbon, whilst molybdenum and vanadium tended to form carbides in ductile iron. Nickel increased the stability of austenite, whilst chromium, molybdenum and vanadium tended to decrease the stability of austenite. For fully-ferritic ductile iron, each per cent. nickel would change the properties as

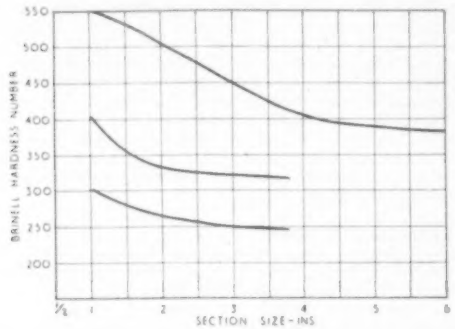


FIG. 5.—*Effect of one-hour temper on normalized 3.75 per cent. Ni, 0.55 per cent. Mo ductile irons in various section-sizes.*

Key:—As normalized (top line), 510 deg. C. temper (middle line), 620 deg. C. temper (bottom line).

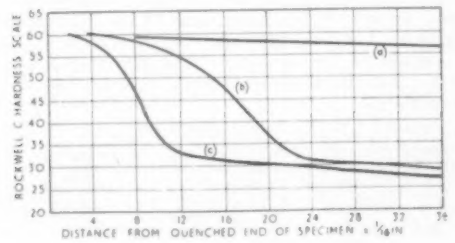


FIG. 6.—*Graph illustrating the effect of nickel and molybdenum on the hardenability of ductile iron.*

Key:—(*a*) 2 per cent. Ni, 0.3 per cent Mo.; (*b*) 2 per cent. Ni; (*c*) unalloyed.

follow: tensile strength + 5,000 lb. per sq. in.; yield strentgh + 6,000 lb. per sq. in.; Brinell hardness +7.0; reduction of area, −2.3 per cent., and elongation, −1.0 per cent. Hence, nickel could be added to ferritic ductile iron to improve its tensile and yield strengths.

Alloying

For low-alloyed ductile iron, alloying could be done by adding the alloys to the base charge in the melting unit, and alloying additions could also be made in the ladle, providing the temperature of the metal was sufficient to melt the alloys. Mr. Savage added that nickel could be added conveniently by using nickel/magnesium or nickel/silicon/magnesium additives for treatment.

The austenitic family of ductile irons could be produced by adding approximately 20 per cent. or more of nickel and/or small amounts of chromium to ductile iron in the base charge. Tensile strengths of 27 tons per sq. in. with corresponding 30 per cent. elongations were provided in certain austenitic ductile irons. Various types of austenitic ductile iron could be made by varying the nickel and/or chromium content and he added that austenitic ductile irons provided the highest quality heat- and corrosion-resistant cast iron with high tensile strength and good impact properties which was available in the ironfoundry industry at the present time.

Concluding his paper, Mr. Savage said his objective had been to introduce the foundryman to the possibilities afforded by alloying ductile iron and every foundry should explore this possibility for expanding its markets.

Northern Fuel and Power Exhibition

The Northern Fuel and Power Exhibition was opened in the new Queens Hall, Leeds, on October 18 by the Parliamentary Secretary to the Ministry of Power, Mr. J. C. George, C.B.E., M.P., and stays open until October 27. The Lord Mayor of Leeds, Alderman P. A. Woodward, J.P., presided at the opening ceremony in the Hall's conference theatre.

Very modern equipment, from small items to large steam boilers complete with all ancillaries, were on view at the various stands in such a manner as to "highlight" their instrumentation. Cut-away sectioning of many of the units aided in the viewer's appreciation of operating detail and also conveyed the meaning of what is meant by the term "packaged" when applied to such plant. Even the largest exhibit appeared to have been "crowbarred" in one piece into position.

Exhibits were staged by nearly 100 of Britain's foremost concerns on about 40 stands and ample floorspace between them made for easy viewing. Inescapable was the progress being made with such equipment as a result of ceaseless research and experiment in the conservation and economy in use of different fuels, along with superlative performance. It seems necessary now only to state the purpose and the temperature required for any job or process and the answer "comes over the counter" so to speak.

In the exhibition, there are shown no actual applications of heat to foundry equipment or processes, but many stands have castings in various metals, cutaway sections or complete assemblies weighing up to 15 cwt. in some instances. The finish on these, both inside and out, is excellent and indicates that mouldingshop progress keeps pace with other branches of engineering. Side by side with welded units, the symmetry of line and better styling of the cast items is clearly demonstrated to any designers amongst the visitors. For any foundrymen from works where tradition dies hard and old-time melting and drying methods prevail, a visit to such a show as the Exhibition of Fuel and Power will dispel any misgivings about the worthwhile nature of the changeover which has taken place in favour of better control and more comfortable working conditions.

The exhibition is sponsored by "The Yorkshire Post," a newspaper which gives prominence to industrial matters. The organizers, Modern Exhibition Services, are to be congratulated on their enterprise and initiative in staging it so well.

Equipment & Supplies

Shears and Baling Presses

Sheppard & Sons, Limited, Bridgend, Glamorgan, have introduced the Scrapmaster range of hydraulically-operated shears and baling presses for scrap processing. The equipment has been developed by the Harris Foundry and Machine Company of Cordele, Georgia, USA, with whom Sheppard & Sons, Limited, have entered into a sole manufacturing and sales licensing agreement for the United Kingdom, Europe and elsewhere.

The hydraulic shear range is based on two distinct types of machine: shears with a baler type charging box and, alternatively, shears equipped with a compression side-type charging box. The baler type enables scrap to be gathered together and compressed within the box—as it closes—into a high-density load, prior to shearing into lengths (which can be pre-selected). In this way, scrap charges bigger than the box itself can be processed, this feature being common to the alternative compression side-type charging box. Coupled with these features, it is claimed, are shearing capacities from 300 to 2,000 tons force, capable of processing both light and heavy types of scrap.

Dust and Fume Sampling Apparatus

Visco, Limited, Stafford Road, Croydon, Surrey, have designed sampling apparatus to record dust, grit and fume emission from foundry and other stacks. Marketed under the name V.I.S.A. (Visco isokinetic sampling apparatus) the equipment is a production version of a system based on the principles issuing from recent investigations by the British Iron and Steel Research Association into atmospheric pollution. The apparatus consists essentially of five linked units—sampling probe, filter unit, cooling coil, pump unit and instrument unit—and, in addition, a combined pitôt tube and pyrometer is provided for measuring gas velocities and temperature. Advantages claimed for the new apparatus are the ease with which it can be used in confined spaces and the speed at which samples can be taken, for example, it is reported that the filter can be changed within 30 sec.

Counter

The new electromagnetic counter, series P43, recently introduced by Lancashire Dynamo Electronic Products, Limited, Rugeley, Staffs, has facilities for predetermined batch operation combined with an indication of total count. The series is designed to enable the operator manually to preset any batch from 999,999 downward and when the set number is reached an internal switch is actuated. Manual and electrical reset facilities are provided and the units are designed for counting speeds of up to 1,500 impulses per minute. Constructional techniques include plug-in facilities, interlocking dove-tailed castings for building up blocks of counters, and alternative flush panel and proud mounting arrangements; supply pressures of from 6 to 220 v. are suitable.

Petrol Engine (Lightweight)

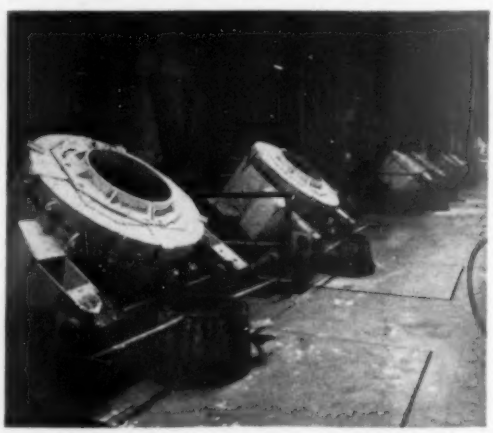
The latest addition to the range of four-stroke petrol engines produced by the British Small Arms Power Unit Division, Studley Road, Redditch, is a 50 cc. model weighing only 14 lb. This engine represents a departure from the firm's normal practice in that it is basically a die-cast aluminium-alloy unit with integral crankcase and a cast-in iron cylinder-liner. Particularly suitable for use in lawn mowers and allied equipment, it is reported to have many industrial applications. A recoil starter is a standard fitting, and a standard pulley for emergency starting is also available. The valve seats are of cast-in iron and the cylinder-head and crankcase end-cover of aluminium.

Non-metallic Shotblast Abrasive: A non-metallic shotblast abrasive, "No-Met," is announced by Bradley's (Darlaston), Limited, a member of the Staveley group of companies. Shotblasting is now generally recognized as the best way of preparing large areas of steel work for painting, but site conditions may prevent recovery of the abrasive material. No-Met was developed to fulfil the demand for a cheap, expendable abrasive for this type of work. Recent trials on bridges, ships' hulls and oil tanks have left steel surfaces with an excellent key for priming paints. No-Met is free of silica and thus complies with the shotblasting regulations.

Lubrication Systems. Castrol Industrial, Limited, Castrol House, Marylebone Road, London, N.W.1, in a well-illustrated brochure describe the Universal system of two-line centralized lubrication equipment. It is said to be suitable for either oil or grease and can be operated in parallel or progressively or in combination. It is stressed that departments for installation and servicing are available.

Melting for Die-casting

Eight basin-type tilting furnaces of 500 lb. (225 kg) aluminium capacity at the Wood Lane, Birmingham, works of Aeroplane and Motor Aluminium Castings, Limited, comprise the largest battery of this make and size of furnace in the United Kingdom. The illustration shows six of the furnaces supplied by Morganite Crucible, Limited, Norton, Worcester, which are now being used for the rapid melting and pre-treatment of an aluminium alloy for the pouring of what are believed to be the first gravity-die-cast overhead-valve aluminium cylinder-heads produced in this country. At present, these cylinder-heads — formerly, always sand cast — are being supplied for cars produced by the Rootes Group, Daimler Cars, Limited, and other makers.



"Sticks" of Patterns

Grouping of Simple Patterns aids Production

. . . . By "Checker"

Sticks of patterns can be used to advantage when large numbers of small castings are required. Instead of producing these from one pattern, or several separate patterns, it is better whenever possible, to use a group of patterns joined together with one common coreprint. This method can be

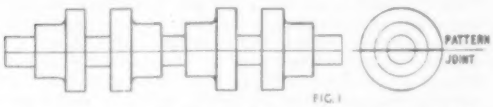


FIG. 1.—*A simple stick of four patterns served by one "roller" core is set in-line.*

applied to a variety of patterns, where there is a straight round core through the pattern, or where the core shape is of some other simple design. The corebox is made sufficiently long to produce a core for the whole length of the stick of patterns.

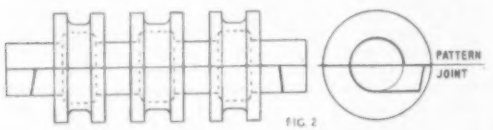
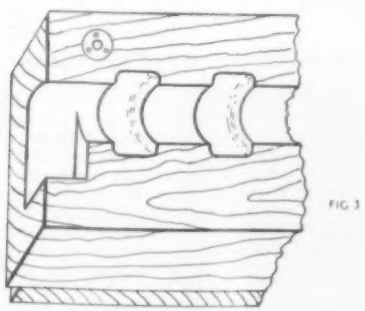


FIG. 2.—*In this instance the common core takes out an unmachined chamber and is located firmly by the addition of a core-set to the terminal prints. Below (Fig. 3) is illustrated the form of the corebox to accommodate this.*



Sticks of patterns may comprise any number of individual patterns from three to ten, or even more in some instances. The deciding factor is of course their size, and as it is the usual practice to fix the sticks of patterns on plates or boards, these, and the size of moulding boxes to be used must also be considered, before mounting them. It is common practice to have several sticks of patterns spaced out on a plate—four being a common grouping, but depending, of course, on the space available.

The production of castings can be considerably increased by using this method, and the setting of the cores simplified. As only one core for the whole length is placed in the mould, instead of several small cores, considerable core-setting time is saved. Core setting provides no difficulties with regard to correct positioning, as the lengths of core are seated firmly at each end, and also at the print portion between each pattern.

Patternmaking

A stick of four patterns is shown in Fig. 1. which has a straight diameter core running through the full length. The timber for these patterns would first be jointed and dowelled in halves, then fastened together, and turned to shape and size in the lathe. The stick of patterns illustrated in Fig. 2, shows three patterns combined together,

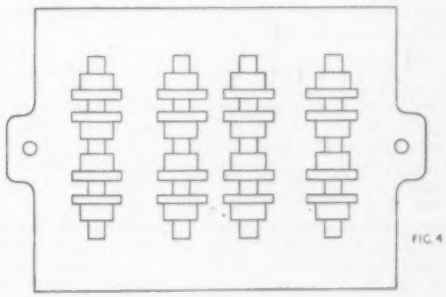


FIG. 4.—*A set of four sticks of the pattern illustrated in Fig. 1 is shown conveniently mounted on a plate. A suitable running and feeding system would have to be added.*

while a cored chamber is required in each casting. It is essential that the core-setting in this instance is accurate, otherwise the whole stick of castings may be scrap. To ensure a perfect positioning for the core, a core-set should be incorporated at each end of the prints as shown. The corresponding parts are cut out of the corebox as illustrated in Fig. 3, both ends being similar. Fig. 4 shows how these sticks of patterns can be mounted on plates—a typical arrangement of four sticks of four patterns each, having been used in this instance—and fixed across the plate. On other occasions it may be more practical and economical to have two sticks of patterns fixed along the plate length.

H

"Common Market" Comment

. . . at British Institute of Management

Addressing the Wolverhampton and district branch of the British Institute of Management on October 11, Sir Alfred Owen, chairman and joint managing director of the Owen Organization, said that membership of the Common Market "is absolutely essential for the future development of Britain's economy." He said that Continental industry had an advantage over the British in having a 45-hour working week compared with Britain's 42-hour week. One of management's chief problems, he said, was the one of communication and personal contact between those in the boardroom and the men on the shop floor. He asked whether British industry was falling behind because youth here was not given its head as early as it should be in industrial management. Did retention of older managers mean that full value was not being got from the money being spent on technical education of the young? he asked. Were young men becoming frustrated and resigned to archaic systems when, on returning from technical courses, they sometimes found older men barring them from putting modern methods into practice? The way in which the Soviet Union had made much more progress in technology than we had in the past few years was due, Sir Alfred considered, to their system of technical education. They gave as broad a training as possible to the pick—about 25 per cent.—of their technical students. The rest were trained in very narrow, specialized fields. This gave them a great pool of technicians which they could concentrate on any particular project. In Britain technical students were given a much wider education and so generally lacked specialized knowledge.

. . . at Wolverhampton Chamber of Commerce

Lord Ebbisham, a past-president of the London Chamber of Commerce, was the guest speaker at the annual banquet of the Wolverhampton Chamber of Commerce on October 12 and responded to the toast to the Chamber of Commerce movement which the Bishop of Lichfield, the Rt. Rev. A. S. Reeve, proposed.

Lord Ebbisham, detailing the problems of Britain's joining the Common Market, said it was misleading to suggest that the choice for Britain was between Europe and the Commonwealth. He did not believe that Britain's joining the Common Market meant the disintegration of the Commonwealth or a lessening of its unity. Commonwealth countries were young and in need of financial help for development and Britain could not provide the capital assistance necessary unless her economy received the stimulus of the European market and of European competition in the home market. Lord Ebbisham thought the Community might grant to the Commonwealth the same special rights of association already granted to territories formerly dependent on "The Six."

On exports, Lord Ebbisham said that in overseas markets Britain had two incalculable assets. There was great goodwill towards her and the desire to buy from her if the terms were right. He agreed with critics who said that British representatives did not travel enough.

Finally Lord Ebbisham suggested that if Britain did not join the European Economic Community—and if she did not it would probably be over the Commonwealth question—then it would be not unreasonable to ask what the Commonwealth would be prepared to do to help Britain.

Law Cases

Boots not in Stock

At West Bromwich County Court, Judge E. G. H. Beresford awarded £200 damages with costs to Mr. Laurence Kerrigan (60), a machine moulder, against his employers, William Cross & Son, Limited, Lyng Foundry, West Bromwich, for injuries sustained in an accident at the company's works in March, 1960, when his left foot was burned by molten metal. Kerrigan told the Court that he was injured because he was wearing ordinary boots and the molten metal got through the tag holes. His industrial boots had worn out and the firm had no others of his size in stock.

Mr. F. Allen, for the company, called no evidence and said he had to accept that there was a period during which industrial boots were not available, but it was unreasonable for employees to ask for them without reasonable warning. Judge Beresford said that employers who undertook to supply their men with essential protective clothing "must not let their stocks run so deplorably low that they have no boots at all in stock."

Safety Precautions Neglected

"Where there is any question of a piece-time worker having to wait, then common sense and safety seem to fly out of the window," said Judge Ernest Ould at Sheffield County Court, when he dismissed with costs an action against the Brightside Foundry & Engineering Company, Limited. Mr. Thomas Billingham, aged 53, turner and borer, and a shop steward, claimed damages for personal injuries, alleging negligence on the part of the firm. The firm denied negligence and alleged contributory negligence on Billingham's part for an accident in which his foot was injured. The judge said it was the "old, old story" which they were constantly meeting in claims before the court. He stated, "He can't blame the employers if he fails to carry out the system which both parties agree is the proper one. He couldn't wait and take the steps he should have done." Special damages of £49 15s. 3d. were agreed before the hearing.

"Russian Castings Production"

The May issue of *Russian Castings Production*—the complete English translation of the Russian foundry journal, *Liteinoe Proizvodstvo* (published with the support of the Department of Scientific and Industrial Research by the British Cast Iron Research Association) contains no fewer than 10 articles on nodular iron and three on the graphitization of iron. The balance of the issue is made up of one article on malleable iron, one on the drying of moulds, one on steel castings and three general articles on foundry pig-irons from works in the Urals, technical terminology in the foundry industry, and wear-resistant antimony cast iron. In addition to full-length articles, there are eight short, practical contributions under the heading "Exchange of Experience." On page 234 of the issue, there is a useful list of factors for converting units used in Russian technology into English units. Single copies of the journal, price 30s. (35s. outside the UK) can be obtained from the British Cast Iron Research Association, Bordesley Hall, Alvechurch, Birmingham. The annual subscription rate is £10 10s. in the UK and £12 10s. overseas.

Dinners

CATALIN, LIMITED

Over 350 members of the firm's staff and their personal guests participated in the Jubilee Dinner held on Friday last to celebrate the 25th anniversary of Catalin, Limited. The function was held in the Regal Rooms, Edmonton, many of the company travelling by coach from the area of the works, which is situated at Waltham Abbey, Essex. Guests were welcomed by the company chairman, Mr. J. E. Currie, assisted by fellow directors, including Mr. J. C. Saywood and Mr. A. J. Perryman, and senior executives of the firm. After the Loyal Toast, proposed by the chairman, that to the Company was proposed by Mr. H. H. Woolveridge (president, British Plastics Federation) and this was replied to by Mr. Currie. Although they were not one of the largest resin manufacturers, said the chairman in the course of his remarks, they did secure a substantial share of the special resins market. (It is in this field that Catalin, Limited, are known to the foundry industry as manufacturers of resins for mould- and coremaking, and the writer was told that this business is extending.) Mr. Currie added that although there was none present who had been with the firm since its inception, more than 60 per cent. of the employees had from 10 to 15 years' service.

The toast of "The Guests" was proposed by Mr. Perryman, the response in this case being made by Mr. H. Langford Holt (director, Dowty Mining Equipment, Limited, one of the firm's early customers). Following the formal proceedings, the evening was continued with a cabaret—Barrie Manning's "Champagne" floor show—and dancing until 1 a.m. to Joe Hart's orchestra.

FOUNDRY TECHNICAL GROUP

Between 70 and 80 past students of the National Foundry College (including some of last year's Diploma winners) now enrolled in the Foundry Technical Group, had dinner together on Saturday evening last, following technical discussions and the Group's annual general meeting that afternoon, all held at the Victoria Hotel, Wolverhampton. Dr. J. G. Pearce, their president, was in the chair, the sole guests being Mr. G. W. R. Lines, director of education for Wolverhampton, and Mr. A. R. Parkes, Editor of the FOUNDRY TRADE JOURNAL.

Mr. Lines proposed the toast of the Foundry Technical Group, saying that although he was not a foundryman, protracted contact with National Foundry College matters and deliberations amongst the College governors had led him to believe that as an outsider he could see more than a little of "the game." It was clear to him that the foundry industry at large does not yet appreciate what it can get from the College and does not support it adequately. He elaborated this theme further to survey the technical educational needs of the country at the present day and the particular requirements of the foundry industry to secure executives, comparable in status to university graduates, but with vastly more industrial experience and a fundamental knowledge of founding. Dr. Pearce replied to this toast, supplementing Mr. Lines, remarks from his experience as director for many years of the British Cast Iron Research Association and since then in liaison missions and other appointments in Europe.

Mr. J. B. McIntyre then proposed the toast to "The Guests" and Mr. Parkes responded, mentioning his and Mr. Lines' pleasure at being invited again this year to this function and for the opportunity to renew acquaintance with what might be regarded as the vanguard of foundry supervision. Increasing use by firms advertising for staff of the phrase "Foundry College diploma-holder preferred" and the fact that at least two members of the FTG were in line for election to branch presidential status in the Institute of British Foundrymen were quoted by Mr. Parkes as examples of increasing achievement by the Group of its aims and of realization by the foundry industry of its members' capabilities.

NFC Diploma Winners

The following students at the National Foundry College, Wolverhampton, were successful in the 1961 Diploma examination:—Mr. B. Ashby (distinction: non-ferrous project), Mr. E. D. Bell, Mr. J. Billinge, Mr. F. A. Bolli, Mr. P. D. Bonson, Mr. P. Coyle, Mr. R. C. Drywood, Mr. D. W. Farquhar (distinction: non-ferrous project), Mr. J. Fotheringham, Mr. P. A. Johnson, Mr. C. L. Kent, Mr. J. E. Long, Mr. P. Lownsbrough, Mr. W. S. Petch, Mr. J. H. Price, Mr. L. J. Shaw (distinction: non-ferrous project), Mr. D. Slade, Mr. E. Sturgess, Mr. M. J. H. Taylor, and Mr. J. Wilkinson.

Hungarian Congress

Arriving too late for inclusion with last week's JOURNAL report of the Second Hungarian Foundry Congress, this picture shows Dr. D. V. Atterton delivering his lecture on exothermic aids; he is accompanied at the rostrum by Mr. O. Szenes, who interpreted. On the platform (l. to r.) are Mr. L. Safar, Mr. J. Payer, and Mr. F. Varga (Editor of the Hungarian foundry journal *Ontode*). The meetings were held in the *Technika Hazaban*, Liberty Square, Budapest, under the auspices of the Hungarian Mining and Metallurgical Society.

BSFA Annual Conference

The 1961 annual conference of the British Steel Founders' Association was held at the Gleneagles Hotel, Perthshire, from Tuesday to Friday, October 10 to 13, and was attended by 70 representatives of member-firms and their ladies. At the resumed annual general meeting of the Association, Mr. M. C. Lloyd, M.B.E. (F. H. Lloyd & Company, Limited) was unanimously elected vice-chairman of the Association to fill the vacancy created by the resignation of Sir William Scott on grounds of ill-health.

Mr. F. Kermit Donaldson (executive vice-president, Steel Founders' Society of America), Mr. W. S. Scott, M.A., and Dr. A. H. Sully, M.SC., PH.D., F.I.M., F.INST.P. (chairman and the director of the British Steel Castings Research Association) and Professor J. M. Halliday (secretary, Scottish Steel Founders' Association) and their ladies attended the conference as guests of BSFA. Mr. Donaldson addressed the general meeting of members on October 11 on the "Steelfounding Industry in the U.S.A. and the activities of the Steel Founders' Society of America" and Mr. John Bolton, director, BSFA, presented an appreciation of "The Condition and Prospects of the UK Steelfounding Industry and the BSFA."

The BSFA Golf Handicap Cup was won by Mr. A. Walker, and the "Scratch" Cup by Mr. J. T. Shelldrake, the Jopling Rose Bowl being won jointly by Mrs. J. I. Nicholson and Mrs. D. McLean. The "International" golf match was again won by Scotland.

During the course of the conference, the ladies visited Lundin Links where they were entertained to cocktails by Mrs. C. H. Kain and a visit was also paid to the glass works of John Moncrieff, Limited.

Foundry Practice Courses

The National Trades Technical Societies have organized a course on modern foundry practice, consisting of 20 demonstrations at various works in the Sheffield area and discussions. Under the leadership of Mr. J. J. Cowley, the first two sections of the course were held on October 10 and 17, and the remaining sections will be held on the following Tuesday evenings commencing at 7 p.m., at the University, Mappin Street, Sheffield. The syllabus includes the reading of drawings and blueprints, patternmaking and design of castings, foundry sands, moulding methods, etc., foundrywork and individual jobs, and research and developments, and the following firms have kindly given permission for demonstrations at their works:—Edgar Allen & Company, Limited, Brightside Foundry & Engineering Company, Limited, British Steel Castings Research Association, David Brown (Industries), Limited, English Steel Corporation, Limited, Hadfields, Limited, Laycock Engineering Company, Limited, Newton Chambers & Company, Limited, and Samuel Osborn & Company, Limited.

Details of the additional study courses on engineering practice and toolroom engineering are available from the Registrar, Sheffield Trades' Classes, The University, Sheffield, 1.

The fee for one course is 20s. and for any two courses, 25s. Special lecture Course Certificates will be awarded by the National Trades Technical Societies to members who attend the minimum of the two-year graduated courses, put in 75 per cent. attendance, and present notebooks of a suitable standard. In addition, a book prize will be awarded for the best notebook in each class.

Company News

FIRTH CLEVELAND, LIMITED—Treasury consent has been given for the sale for £1,927,940, cash, of the company's 56.7 per cent. holding in the Solartron Electronics Group, Limited, to Schlumberger, Limited, an international organization giving technical services to the oil industry and which has substantial interests in electronics.

THOS. W. WARD, LIMITED, manufacturers of coke, iron, steel, and machinery, etc., of Sheffield—Group net profit for the year to June 30, 1961, increased to £1,592,601 (£1,468,249) after tax of £1,356,597 (£1,352,165). Final dividend of 10 per cent. makes a total of 13¾ per cent., the same equivalent, adjusting for a one-for-one scrip issue, as for the previous year.

STOTHERT & PITT, LIMITED, cranemakers, engineers ironfounders, etc., of Bath—Profits fell sharply from £1,088,328 to £737,395 in the year to June 30, 1961, mainly due, the directors say, to the disastrous floods which occurred in October and December of last year. The December flood was the worst recorded for over 80 years and caused considerable dislocation in the company's works, with serious loss of output. The dividend is maintained at 20 per cent. with a final of 15 per cent.

RANSOME & MARLES BEARING COMPANY, LIMITED, manufacturers of ball and roller bearings, and lineshafting equipment, of Newark (Notts).—Net group trading surplus has fallen by about 23 per cent. to £1,354,000 for the year to June 30, 1961. After tax of £594,632 (£814,000) and depreciation of £453,000 (£381,000), the group net profit for the year was £759,419 (£902,513). A second dividend was declared at the beginning of September, maintaining the total at 14 per cent. for the year, and no further dividend is to be recommended.

RICHARDSONS, WESTGARTH & COMPANY, LIMITED, marine, turbine, electrical and general engineers, boilermakers and ironfounders, etc., of Wallsend-on-Tyne—The directors state that the reorganization measures, outlined last August, do not reflect any alteration in the company's policy towards the marine engineering market. On the contrary, they add, it is hoped that the administrative changes now being implemented will materially strengthen the ability of the subsidiary companies within the group, George Clark & North Eastern Marine (Sunderland), Limited, the North Eastern Marine Engineering Company, Limited, and Parsons Marine Turbine Company, Limited, to compete more effectively under the present difficult conditions.

LAKE & ELLIOT, LIMITED, steelfounders, etc., of Braintree (Essex)—The final dividend is 8¼ per cent. on capital increased by a one-for-three scrip issue, compared with the forecast maintenance of the previous 7½ per cent. on the increased capital for the year to 12½ per cent. on the increased capital for the year to July 31, 1961, against a 9¾ per cent. equivalent. Group profits have more than doubled at £564,169 (£260,021) and, after tax, the net balance is increased to £263,808 (£117,385). Although the short-term order position is satisfactory, Mr. C. J. Lake, the chairman, stresses that sustained effort is needed to keep all activities in full production. Little benefit from Shanks Ironfounders, Limited, acquired this month, is expected in the coming year, and it may take up to five years, or more, before the subsidiary in France is fully developed, he says. The French project will enable the group to trade in markets which have hitherto been very difficult to enter. Other negotiations for the manufacture of the group's products overseas are continuing.

ABBF Design Conference

The Association of Bronze and Brass Founders, which will have a stand at the Engineering Materials and Design Exhibition, Earls Court, November 13 to 18, is concurrently to hold a design conference for members and their customers. It will be held at the Clarendon Restaurant, Hammersmith, London, W.6, on Tuesday, November 14, and will form part of the Association's campaign for the promotion of the use of copper-alloy castings.

Programme

10.00 a.m. Chairman's opening remarks, followed by "Design Engineers' Requirements from the Copper-alloy Foundry Industry"—a series of short constructive and critical contributions by qualified design engineers representing mechanical, electrical and marine engineering. Open discussion on these topics will precede the coffee break.

11.30 a.m. "Good Casting Design"—a practical talk pointing out design errors and their effect on foundry processes and casting itself—and discussion.

12.15 p.m. "Metallurgical Advantages and Developments"—a series of short informative technical papers.

12.45 p.m. Luncheon and at 2/2.15 p.m. chairman's closing remarks.

Further information may be obtained from the secretaries of the Association, Heathcote and Coleman, 69, Harborne Road, Edgbaston, Birmingham, 15.

Early Pewter Cups

The October 7 issue of *The Times* carried an interesting article under the title "Early Pewter Grace Cups" and dealt with the design of early cups and their use. The article states that in Queen Anne grace cups, the lower part of the body, the foot ring and the cover might be encircled with shallow concave flutes which might be spiralled, this decoration being tool-finished by hand. With increased prosperity in early Georgian days, the custom of grace-cup drinking and toasting became more widespread and two-handled grace cups in pewter became more common. The silver grace cup was lavishly ornamented and from about 1750 was supported on a stemmed foot. The pewterers found it impossible to copy the ornament and continued their plain-bodied "wine pots" encircled with a narrow strengthening rib, but they imitated the stemmed foot. This form, cast and not hammered, continued until the 1790's when pewter two-handled cups disappeared, under competition from the Sheffield platers.

A CONTRACT WORTH ABOUT £300,000 for the major part of the electrical equipment in a new pulp and paper mill being built by Millspaugh, Limited, of Sheffield, for Yugoslavia, has been awarded to the English Electric Company, Limited.

IBF National Works Visits

The accompanying illustration from the Walmesley (Bury) Group, Limited, serves as a vivid reminder that despite mechanization and automation applied to small castings production, there are still some castings where their very size and nature bring into play all the skill of foundry craftsmen. Known as an MG cylinder, this iron casting, weighing in the neighbourhood of 80 tons, is being "put on to its belly" for transit to the firm's machine shop. Walmsley's foundry is only one of the 12 in the Manchester area being visited by IBF parties to-morrow (October 27) as part of the National Works Visits Day programme. The complete list of foundries—grouped in pairs for morning and afternoon visits—are: Leyland Motors, Limited, and British Northrop, Limited; Thomas Robinson & Sons, Limited, and Walmsley (Bury) Group, Limited; Associated Electrical Industries, Limited, and Linotype & Machinery, Limited; British Railways Foundry and Gresham & Craven, Limited; Dobson & Barlow, Limited, and Henry Wallwork & Son, Limited; and George Richards & Company, Limited. Brief particulars of all the 12 foundries—representing all types of production—were recorded in the JOURNALS of October 12 and 19.

Conference on Factory Efficiency

There can be many interpretations of what constitutes an efficient factory but it is unlikely to be disputed that such a factory will be producing goods to meet the requirements of the customer by effective methods and suitable conditions of work for all those employed. This statement heads the announcement of a conference to highlight some of the many factors which can contribute to factory efficiency, which the British Productivity Council is organizing in conjunction with the Factory Equipment Exhibition at Earls Court. It will comprise five sessions from November 13 to 15, under the general title of "Efficiency in To-day's Factory." Details of the programme are as follow:—

Monday, November 13, 2.15 *to* 5 *p.m.:* "Organizing for Product Quality," under the chairmanship of Sir Bertram Waring, chairman and managing director, Joseph Lucas, Limited, and chairman, British Productivity Council.

The first paper at this session will be presented by Mr. Frank Nixon* (Rolls-Royce, Limited, and immediate past-president, European Organization for Quality Control), on "Product Quality: Organizing for its Achievement." Mr. O. L. Lawrence (engineering consultant) will then present "Quality Management in a Small Engineering Company," and Mr. I. R. Smith (Bristol Aircraft, Limited), "Quality Management in an Aircraft Company."

Tuesday Morning Session, 10.15 *a.m. to* 12.45 *p.m.:* "Ergonomics in the Factory" (Fitting the Job to the Worker), chairman, Mr. V. Feather, assistant general secretary, Trades Union Congress.

There will be two papers at this session—"Lighting and Productivity," by Dr. R. G. Hopkinson (DSIR Building Research Station) and "Relationship of Displays, Controls and Layout of Equipment," by Dr. W. F. Floyd (Loughborough College of Technology.) The papers will be followed by the showing of a BPC film "Fitting the Job to the Worker."

Tuesday, Afternoon Session, 2.15 *to* 5 *p.m.:* "Industrial Change and Human Effects." Chairman, the Lord Fleck, former chairman, Imperial Chemical Industries, Limited.

Mr. H. A. Clegg (Fellow of Nuffield College, Oxford), will present "Problems of Industrial Change," and another BPC film, "Dispute" will be shown. There will then be a discussion by a panel composed of Mr. Frank Cousins (general secretary, Transport and General Workers' Union); Mr. Vincent Everard (director, Belliss & Morcom, Limited); Sir George Pollock (director, British Employers' Confederation), and Mr. George Woodcock (general secretary, Trades Union Congress).

Wednesday, Morning Session, 10.15 *a.m. to* 12.45 *p.m.:* "Low-cost Automation," chairman, Mr. W. J. Carron, president, Amalgamated Engineering Union, and immediate past-chairman, British Productivity Council.

The first paper at this session on "Field and Scope of Low-cost Automation," by Mr. K. B. Haskins (Birmingham Technical Advisory Service, Limited), will be followed by two case-studies, the first by Mr. J. B. Dickenson, training officer, Benton & Stone, Limited, and the second by Mr. Ian Nickols (Nickols Automatics, Limited).

Wednesday, Afternoon Session, 2.15 *to* 5 *p.m.:* "Effective Use of Capital," chairman, Sir James R. H. Hutchison, president, Association of British Chambers of Commerce.

"Return of Capital Employed: the use of Interfirm Comparisons," by Mr. H. Ingham (Centre for Interfirm Comparisons); "Return on Investment: Improving the Ratio," by Dr. J. M. S. Risk (Risk & Partners, Limited), and a case-study by Mr. A. J. Speakman (Bowater Paper Corporation, Limited).

In addition to the conference, the BPC is co-operating with the Export Council in staging a one-day conference on November 16 (also at Earls Court) on "Producing for European Markets." Papers at this conference include "Europe's Consumer Goods Requirements"; "Europe's Capital Goods Requirements"; "Producing for European Markets"; and "Facing up to the Challenge." Case-studies will also be presented on units producing consumer and capital goods. Application to attend the conferences should be made to the British Productivity Council, FEE Conference, Vintry House, Queen Street Place, London, E.C.4.

* Recently Mr. Nixon's views on "Control of Product Quality" as relates to cost products were printed in the JOURNAL (July 6, 1961).

New Patents

(Copies of complete specifications are obtainable from the Patent Office, Sales Branch, 25, Southampton Buildings, Chancery Lane, London, W.C.2, price 3s. 6d.).

852,806. Specialloid, Limited, Black Bull Street, Leeds, 10.

A method of making a light-alloy piston. A ring-carrier blank, constructed as an annulus with at most one break, is notched at intervals to define segments joined by bridge pieces—the latter being of such a cross-sectional area that, after casting in position, the stresses set up by the different expansions and contractions during the freezing time will cause them to fracture.

852,870. General Motors Corporation, Grand Boulevard, Detroit, Michigan, USA.

An improvement in the company's Patent No. 831,174, abstracted in FOUNDRY TRADE JOURNAL, February 16, 1961. A mixture of sand and a binder which will set and cure under acid conditions to form a solid synthetic-resin binder is applied to a pattern or corebox. The setting and curing is effected by exposing the mixture to a curing agent in gas or vapour form, which gives rise to acid conditions in the mixture. The mould or core is then exposed to ammonia to neutralize the remaining acidic material.

853,164. Fritz Hansberg, 13, Via Archirola, Modena, Italy.

No electrical connection for moulding machines (particularly of sand-shooting machines) is claimed in this Patent. Pneumatic means are employed in the automatic control of the charging operation. (See also B.P. 672,487 and B.P. 763,036, FOUNDRY TRADE JOURNAL, January 31, 1957.)

853,383. Foundry Services, Limited, Long Acre, Nechells, Birmingham, 7.

Semi-continuous casting processes which are claimed to avoid the necessity of using graphite moulds or dies.

853,490. Imperial Chemical Industries, Limited, Imperial Chemicals House, Millbank, London, S.W.1.

Improved apparatus for the continuous casting of metals and alloys (see also B.P. 708,632). The insert in the mould wall comprises a wrought metallic material (such as super-imposed layers of metal gauze brazed together and reduced by rolling), having a smooth surface finish at one side of the insert which forms part of the mould cavity. This insert is sufficiently permeable to permit the passage of coolant or lubricant.

News in Brief

DURING A VISIT to the Greenock yard of Scott's Shipbuilding & Engineering Company, Limited, in connection with their 250th birthday celebrations, the Duke of Edinburgh announced receipt of an order for one of the biggest ships the company has ever built. It is for a 28,000-ton bulk carrier for Greek owners. The vessel will be 570-ft. long and will cost about £1,500,000.

SOUTH DURHAM STEEL & IRON COMPANY, LIMITED, have secured a contract worth £750,000 for the supply of 55 miles of pipe to be supplied to Kuwait. The pipes, to be made at the company's plant at Stockton-on-Tees, will be supplied in lengths of 40-ft. They are to convey fresh water to the town of Kuwait, and are for delivery in Kuwait by the end of this year. The company states that the contract was secured in the face of fierce competition from Continental and Japanese pipe producers.

THREE NEW THAMES FERRIES are to be built by the Caledon Shipbuilding & Engineering Company, Limited, Dundee. The passenger and vehicular ferries are for service on the Thames at Woolwich and have been ordered by London County Council. The Dundee tender of £804,000 for the three vessels was the lowest. The ferries, designed to carry 1,000 passengers each and 200 tons of vehicles, are stern-loading type—an innovation at Woolwich—and will have cycloidal propellers at bow and stern.

REDHEUGH IRON & STEEL COMPANY, LIMITED, has completed a new factory at Teams, Gateshead, for Redheugh Hydra, Limited. The factory is fully equipped and production of oil burners is "in full swing and steadily increasing," it is announced by Mr. H. A. Parry, director of Redheugh Hydra. A separate section of the new factory is devoted to research and development and, said Mr. Parry, "we hope to announce shortly details of a revolutionary development in the firing of vertical boilers."

OFFICES to-day have to cope with increasing paper work, needing extra staff, equipment and accommodation, all resulting in rising costs. How can these be cut to reasonable proportions; what information does the manager really need for his job; is he getting more than is really necessary? These and other questions will be examined at a one-day conference of the British Institute of Management on "Efficiency in the Office" to be held at the Connaught Rooms, London, W.C.2, on Thursday, November 23, from 9.45 a.m. to 5.00 p.m.

A £1,500,000 EXTENSION to the works of W. H. A. Robertson & Company, Limited, of Bedford, a member of the Tube Investments engineering division, which was held up in June, is now being resumed, and should be completed by the end of 1962. The hold-up was due to the shortage of skilled labour and difficulties foreseen in manning the extensions, matters which have been met by a housing agreement with the Bedford Town Council. The project will include heavy-machine and erection bays capable of handling weights up to 300 tons.

A RETIREMENT BENEFIT SCHEME for their shipyard and engineering employees is being introduced by John Brown & Company (Clydebank), Limited. Under the scheme about 4,000 of the firm's employees between the ages of 25 and 65 will receive up to £300 when they retire. Mr. John Brown, managing director of the firm, said that the decision had been prompted by the firm's wish to retain their skilled men and to strengthen their good labour relations. It is a non-contributory scheme, and the firm are carrying the cost of it. The benefit awarded will depend on the employee's length of service.

A NUMBER of solid-fuel-fired appliances manufactured by Baxi, Limited, Bamber Bridge, Lancashire, including the Burnall-model underfloor draught fire introduced this year, and the firm's radiator output boiler, have been approved by the Domestic Solid Fuel Appliances Approval Council on behalf of the Ministry of Power. To date, the Council has approved the 16-, 18-, 20-, 22- and 24-in. Burnall model, the 16- and 18-in. Max-air model, the rotary-ashbox, outside-ashbox and deep-ashpit modifications to the Burnall; the 16- and 18-in. radiator output boiler and 16- and 18-in. domestic output boiler.

THE IMPORTANCE OF GOOD DESIGN in industry was the subject of the opening remarks of Mr. A. R. Miller, chairman of the Motherwell Bridge & Engineering Company, Limited, at the display of "Good Design of Form and Colour," staged in the furnishing house of the local firm of Form & Colour, Limited. Items displayed had been selected from stock and arranged by representatives of the Council of Industrial Design from the Scottish Centre in Glasgow. All the exhibits are listed in the design index of the Council as being goods of a specially high standard of design. All are necessarily of British manufacture.

IN AN EFFORT TO ATTRACT SHEFFIELD FIRMS to Penistone, the Penistone Labour Party is making a survey of those who are available for work in the area. They are planning to put the town back on the industrial map. In the early 1920s it was well-known as a steel-manufacturing town but many of the firms disbanded and amalgamated in the depression. Residents are being asked if they will support the idea of new industries. It is hoped to attract Sheffield steel and light engineering industries. It is estimated that 68 per cent. of Penistone's working population travels elsewhere to work each day, either to Sheffield, Stocksbridge, Barnsley or Huddersfield.

STANTON IRONWORKS COMPANY, LIMITED, have awarded to Stothert & Pitt, Limited, engineers, Bath, a contract for the design, construction and erection of a complete slag-preparation plant at Stanton for the manufacture of road materials, railway ballast, filter media, tarmacadam and asphalt. The value of the contract is approximately £400,000. The plant has a designed capacity of 200 tons per hour, with the possibility of increasing later to 300 tons per hour. Electric controls reduce the labour force to an absolute minimum. The proportioning and coating plant will have an output of up to 150 tons per hour and will be controlled by one man operating an electronics panel with programme tablets. The plant is due to start operating in the autumn of 1962.

PRESIDENT FRONDIZI OF ARGENTINA recently signed a decree granting special concessions to foster the development of Patagonia. Argentine firms establishing or extending factories in the following industries may obtain concessions provided in the decree: aluminium and metallurgy in general, wool textiles, fishing, chemicals and petrochemicals, provided that the raw materials of the region, or raw materials not produced in other parts of Argentina, are used. Firms coming within these categories may obtain total or partial exemption of up to 10 years from certain duties, taxes and surcharges. Existing firms wishing to obtain the exemptions must apply within 180 days of the publication of the decree, and qualified firms will be given priority in the supply of natural gas.

A 30-TON FURNACE, of the mains-frequency crucible type, believed to be the largest of its kind in the

News in Brief

world, has been developed by Asea, Sweden's leading electrical engineering industry. The first unit has been in operation for some time at Akers Styckebruk, a central Swedish ironworks, and a similar unit has recently been supplied by Asea to the same company. Furnaces of this size have not been built previously owing to the problems encountered in designing the crucible and its lining. Asea has now developed a durable lining, and the first unit has been working continuously for over seven months without it being necessary to change the crucible. During the period about 7,000 tons of iron have passed through the furnace, the temperature of the melt being 1,450 deg. C.

Moorwood-Vulcan, Limited, Sheffield, following their recent acquisition of Euk Catering Machinery, Limited, have appointed several executives of the latter firm to key positions in their sales force. Mr. F. S. DAWSON, formerly sales manager, Euk Catering Machinery, Limited, has been appointed home sales manager. Mr. W. G. ANSON and Mr. E. N. HUGHES have been appointed area sales managers. Mr. Anson will continue to operate in the north, and Mr. Hughes takes over the southern area. Mr. W. D. JOELSON, who joined Moorwood-Vulcan, Limited, earlier in the year from the Brightside Heating & Engineering Company, Limited, Sheffield, has been appointed to the newly-created post of marine sales manager. Mr. I. BULLAS, who was already with Moorwood-Vulcan, has been appointed midlands area manager.

STAINLESS-STEEL CURTAIN-WALLING is to be adopted for the main facade of the new wire department now under construction in Sheephouse Wood for Samuel Fox & Company, Limited, a subsidiary of the United Steel Companies, Limited. The new single-storey building, with an administrative block attached, will be 1,011 by 120 by 30-ft. high. The curtain-walling will consist of a mild-steel glazing system faced with satin-polished stainless-steel pressed mullions and transoms and infill panels of blue vitreous enamelled steel. For the administration block, the walling system is being supplied by the Morris Singer Company, Limited, of London, and will incorporate polished stainless-steel mullions, transoms and ventilators, together with a frieze of pressed panels of vitreous enamelled mild steel in the form of small pyramids.

LATEST NEWS from Leyland Motors about overseas contracts includes the fact that a new fleet of 235 British-built trucks will appear in Israel next year, as a result of £700,000 worth of contracts which have recently been placed. The contracts call for 124 four- and six-wheeled chassis for heavy service, and 111 medium-load four-wheelers. The chassis will be distributed to various Israeli transport companies by the Consolidated Near East Company, Limited, Tel Aviv. (Five months ago Leyland gained a £750,000 contract from Israel for buses and spare parts). Another big contract is from Helsinki City Transport for a fleet of 20 single-deck bus chassis valued at over £70,000. Although this is Leyland's first bus order from Finland for some five years, the company has gained orders for over £2,000,000 worth of diesel engines from there during that period.

COLVILLES' £8,000,000 RAVENSCRAIG (LANARKSHIRE) STEEL MILL will be in service by the end of this year. The new plant, near Motherwell—a "slabbing" mill—will feed the strip mill being built at Ravenscraig and will also supply slabs to the heavy plate mill at Dalzell. It has a rated annual capacity of 1,250,000 tons, but its potential capacity is over 2,000,000 tons a year. The mill was designed by Colvilles, Limited, as part of their £100,000,000 development programme, and most of it has been built in the firm's own workshops. A building more than 300 yards long is used to house the new mill, which is capable of rolling ingots from 10 to 40 tons in weight. The post-war development of Colvilles' steel empire enables the company to raise their steelmaking capacity to 3,300,000 tons a year—an increase of more than 50 per cent. on last year's record production of 2,158,700 tons.

BECAUSE THE NEW ZEALAND GOVERNMENT has refused to vary the agreement on prices to be charged for products from the £2,000,000 copper mill the company planned to build at Wiri, near Papakura, Auckland, I.C.I. (N.Z.), Limited, has decided to defer the project. The Minister of Industries and Commerce stated that the Government was prepared to carry out the agreement between the company and the previous administration. But, he said, the company has sought a variation to the pact involving the price of products from the mill. The Government was not prepared to agree to this and it told the company it should decide within "a reasonable time" whether it was prepared to proceed on the agreed terms. A company official in Auckland said that negotiations with the Government would continue. The proposal had not been abandoned. The copper mill was designed to meet most of the New Zealand demand for copper-base sheet, strip and tube. Savings in overseas exchange were expected to be at least £500,000 a year. New Zealand now imports 4,000 tons of copper products a year.

AUSTRALIAN PRIME MINISTER, Mr. Menzies, has described the new steel industry planned for Western Australia as the most remarkable advance in the State's development since the gold discoveries in the 1890's. He was introducing to the House of Representatives in Canberra a Bill approving the Federal aid agreement for building a standard-gauge railway line about 400 miles long between the goldfield city of Kalgoorlie and the port of Kwinana, near Perth. It will cost £A17,000,000 and will carry 2,000,000 tons of ore a year from the iron-ore reserves, being developed at Kulyanobbing, to a steel plant to be built at Kwinana by the Broken Hill Pty. Company at an estimated cost of £A40,000,000. Mr. Menzies said the BHP project and the new railway would encourage new industries and do much to promote the industrial balances needed in Western Australia. He said the Federal Government's financial contribution to the railway scheme was partly in the interests of development, and also part of the standardization of Australian railways.

Obituary

Mr. FRANCIS JOSEPH SMITH, chief mechanical engineer at Herbert Morris, Limited, engineers of Loughborough, has died at the age of 60. He had been associated with the firm for 46 years.

The death has occurred of Mr. W. F. DINES, a director and general works manager, of Midland Tar Distillers, Limited. He was 59. He was responsible for the designing and building of the company's refinery at Four Ashes.

Mr. A. G. F. CUSWORTH has died, aged 48. He had many friends in the foundry industry in the UK and in the USA—where he had worked for a short time as a service engineer with the Meehanite Metal Corporation of America. Mr. Cusworth began his career with Robey & Company, Limited, Lincoln, later moving to Sheepbridge Stokes, Limited, Chesterfield, and, after the second world war, to Harold Andrews Grinding Company, Limited, Halesowen, as foundry manager where he was particularly concerned with the continuous casting process.

Publications Received

BCIRA Journal, Vol. 9, No. 5. Published by the British Cast Iron Research Association, Alvechurch, Birmingham.

The following are abstracts from articles appearing in this issue:—

Effect of Composition on the Liquidus and Eutectic Temperatures and on the Eutectic Point of Cast Irons, by Dr. J. G. Humphreys.

Author's Summary:

Carbon, silicon and phosphorus all affect the liquidus and eutectic arrest temperatures of cast irons. The liquidus temperature influences fluidity, and strength and chilling characteristics are related to the divergence between the point representing actual composition and the eutectic point on the equilibrium diagram for iron-carbon/silicon/phosphorus alloys. Eutectic graphite content is also involved in the study of soundness of iron castings.

The precise effects of carbon, silicon and phosphorus contents, considered as Carbon Equivalent values, on the arrest temperatures have been studied in hypo- and hyper-eutectic cast irons by means of cooling curves. Formulae have been derived from the results, which are compared with those of previous workers, to define the liquidus and eutectic arrest temperatures of cast iron in terms of composition, and to define more accurately the Carbon Equivalent value.

How to Estimate Cupola-metal Composition by means of Cooling Curves, by R. Jelley and J. G. Humphreys.

Authors' Summary:

In this report a method is described by which it is possible to check rapidly the composition of certain cupola-melted irons by determining the freezing points of small samples. The sum $\frac{\text{carbon, per cent.} + \text{phosphorus, per cent.}}{2} + \frac{\text{silicon, per cent.}}{4}$ can be determined to a high degree of accuracy from the temperature at which freezing begins, and knowledge of the approximate phosphorus and silicon contents of the iron will, therefore, give an indication of its carbon content. Alternatively, the freezing temperature range may be used to give a measure of the Carbon Equivalent of the iron, which for many purposes represents a very useful form of control test. The experimental technique is simple and the apparatus is easily obtainable. This method of composition control of cupola-melted iron is, therefore, within the scope of many foundries producing hypo-eutectic iron.

Properties of Hot-box Corebinders, by D. A. Taylor and M. J. Clifford.

This is a very important and interesting report upon a comparatively new subject. The authors have investigated the properties of a range of suitable binders including glucose-base materials, urea, phenol and melamine formaldehyde, urea and phenol furfuryl resins, and some combinations of these, and their results are quoted.

In general, state the authors, hot-box core production is only applicable to those foundries making repetition castings on a large scale, but it offers many advantages over conventional core-making techniques.

Accuracy: The production of a finished core within the box enables a high degree of dimensional accuracy to be achieved, eliminates the use of dryers and reduces the subsequent dressing to shape that may be necessary in normal production methods.

Speed: With the binders available even large mass-produced cores can be made in times measured in seconds instead of hours. The hot-box process lends itself to automation, since one machine can blow, cure and strip cores and then deliver them ready for assembly in the mould, thus dispensing with core stoves, carriers and core plates.

Cost of Materials: The cost of the hot-box process raw materials compares favourably with that of the commonly-used combinations of oil, starch and dextrin. There is usually a reduction in cost when the solid hot-box cores are compared with hollow shell covers, and the sand pre-coating equipment used for shell moulding is unnecessary.

The main disadvantage of the hot-box process is in the initial expenditure incurred in corebox installations and the possibility that heating costs will be higher than with normal stove procedure. Further, there is, at present, some indication that certain of the hot-box binders are prone to give pinholing in cast irons containing small percentages of aluminium.

Effect of Heat-treatment on Tensile and Impact Properties of High-strength Nodular Cast Irons, by B. R. Douglas and G. N. J. Gilbert.

The authors have summarized their findings in the following statement:

The results presented in this paper were obtained on four nodular cast irons produced commercially by different manufacturers during normal production runs. Three of the materials were nickel-magnesium treated and one was produced by the direct addition of magnesium. The results are considered to represent the normal range of properties which are regularly obtained commercially. The results on these materials have been substantiated by tests carried out on a material produced in the laboratories of the British Cast Iron Research Association.

Tensile results confirm the well-known effect that improved high strength properties can be obtained by applying one of the following heat-treatments to nodular iron: (1) Hardening and tempering; (2) normalizing; (3) normalizing and tempering; (4) semi-annealing.

It is shown conclusively that the prpoerties obtained when these heat-treatments are applied to an iron which has previously been annealed to the ferritic condition are in no way superior to those obtained when an as-cast material is treated. In general, slightly lower strengths are obtained after pre-ferritizing and there is little or no compensating increase in elongation.

The highest tensile strengths were obtained after normalizing, and this treatment also resulted in an improvement in elongation over that obtained in the as-cast material. Tempering a normalized iron did not give any improvement in properties and this treatment appeared unnecessary for the range of section size and chemical compositions investigated. A tempering treatment should be reserved for irons which, because of small section size or unusual chemical composition, require some softening treatment after air cooling.

Chemical composition and control of the annealing cycle have an important bearing on the structure obtained after a semi-annealing treatment, and a wide range of tensile properties is available, varying between those obtained from a fully ferritic iron and those from a substantially pearlitic iron. In general, however, the test results indicate that this treatment resulted in an increase in strength compared with the as-cast iron and gave an elongation superior to that obtained by other treatments.

In the hardened and tempered condition again a wide range of tensile strengths can be obtained. The results indicate that care should be taken not to temper

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at too high a temperature, since this causes a decrease in tensile strength without a compensating increase in elongation. In the present tests a standard heat-treatment was used, but this might profitably have been varied slightly for the different materials in order to obtain optimum properties. The manufacturer should determine the most suitable treatment for his own particular material.

The impact results confirm that a normalizing treatment results in a decrease in transition temperature and an increase in tensile properties; part of the increase in strength is due to a refinement of the pearlite and an increase in hardness, and part to the decrease in transition temperature. The decrease in transition temperature is associated with homogenization of the structure which occurs as a result of holding in the austenite range.

The impact results show that other treatments such as hardening and tempering, and semi-annealing, which involve holding in the austenite range, also result in a decrease in transition temperature. The impact results on the hardened and tempered irons are remarkable and show that these materials have very low transition temperatures compared with irons given other heat-treatments. The impact transition temperature was in all cases well below room temperature, indicating that a hardened and tempered iron could prove useful where some degree of shock loading is required in addition to a high tensile strength. In this respect hardened and tempered irons of equivalent tensile strength would be superior to normalized or semi-annealed irons.

Sandoz, Bishop and Pellini have also shown that there is an improvement in ductility due to quenching and tempering. They did not, however, consider irons quenched from the austenite range, but irons which were only partially-austenitized by holding within the critical range at temperatures between 760 deg. and 840 deg. C., depending on chemical composition.

Hardening and tempering results in a very fine structure being obtained and this, together with homogenization which may be to a greater degree in a hardened iron, is considered to account for the very low transition temperatures which are obtained after this treatment.

The results on iron 3 are remarkable, since the hardened and tempered iron has a lower transition temperature than the annealed iron. This material had a relatively high silicon and phosphorus content which accounted for the high transition temperatures obtained in the as-cast and the annealed conditions. It appears that some form of embrittlement associated with these elements is prevented when the material is quenched from the austenite range.

Production and Properties of Nodular-graphite Structures in Heavy-section Castings, by R. Barton.

For this report the author has provided the following summary:—

Little information has been available on the production of nodular-graphite structures in heavy sections. A programme of work has been carried out at the Association, using 12-in. dia. test-bars, in which the graphite structure produced has been correlated with the raw materials used as a basis for the furnace charge, and with the Carbon Equivalent of the irons.

Results show that the use of high purity pig-iron as the basis of the furnace charge may result in degenerate graphite structures when the Carbon Equivalent value of the iron is high. This effect can be eliminated by a small addition of arsenic. The annealability and mechanical properties of these heavy-section nodular iron castings were also investigated. Specimens taken fom the 12-in. dia. bars were annealed for various times and the effectiveness of the treatment assessed in terms of the amount of residual pearlite. Tensile properties were determined for as-cast and normalized samples and both tensile and impact properties for the annealed samples and it is concluded that providing a suitable matrix structure is obtained by appropriate heat-treatment, the properties of test-bars from heavy section nodular irons are entirely satisfactory.

Your Break-through to Comfort. A booklet issued as an inset supplement to the October issue of *Reader's Digest.*

This 16-page booklet has been issued by the National Coal Board in a major publicity effort for the use of solid fuel for domestic heating. In launching the booklet at a luncheon given by the *Reader's Digest* in London last month, Lord Robens, chairman of the National Coal Board, said that there had been a rapid rise in standards of comfort in British homes over the last 10 years, but in our climate the basis of all comfort was proper heating. We lagged behind in modern standards of heating—only about 5 per cent. of British houses were centrally heated, compared with 80 per cent. in the US. There was evidence that householders believe that solid fuel provides the most satisfactory heating at the lowest cost, and the NCB was determined to prove this true by making the facts known to every householder. Central heating developments are reviewed, cost comparisons are given, the implications of the Clean Air Act are explained, and there is a host of other facts about cooking, hot water, and getting the best value out of solid fuel. It is unquestionably a first-rate piece of publicity which, if successful, will bring business to founders making solid-fuel-burning appliances.

House Organs

The Steel Casting, No. 59. Issued by F. H. Lloyd & Company, Limited, and associated companies.

Quite a feature of this issue is the inclusion of three addresses to the Works Council—by Mr. M. C. Lloyd, joint managing director (on sales); by Mr. C. Nelson (on development), and by Dr. A. B. Davies (on health and safety). The reviewer's opinion is that there can be no better method of transfer of information from the boardroom to the shop floor than the utilization of the medium of the Works Council, especially when this is followed by printing of the talks in the firm's house magazine. The general contents of the issue well fulfil the function of interesting works personnel in the problems, aspirations and conduct of the company.

Broomwade News Bulletin, Vol. 24, No. 4. Issued by Broom & Wade, Limited, High Wycombe, Bucks.

This issue gives some details of Broomwade plant in a die-castings foundry. The account carries some evidence that improvisation still persists in the foundry industry, as an inelegant corrugated drum is shown in use as a worktable. This issue also shows that the employees have available a charming cricket field attached to Hughenden Manor.

Cement Special, No. 4. Issued by the Lafarge Aluminous Cement Company, Limited, 73 Brook Street, London, W.1.

This issue carries an article covering the use of Secar 250 calicium-aluminate cement as a material for lining electric-arc furnace roofs, doors, etc. Another application is for the making of statues by sculptors.

Personal

Mr. C. W. HICKS has joined David Budworth, Limited.

Mr. D. FLEMING has joined Cupodel, Limited, as general manager.

Mr. A. E. PARKES has joined International Combustion, Limited, Derby.

Mr. B. R. HOUGH was recently appointed sand controller of Parker Foundry, Limited.

Mr. H. S. GARNICK has been appointed an additional director of Lake & Elliot, Limited.

Mr. D. L. COLLETT has joined Foundry Equipment, Limited, as a development engineer.

Mr. J. SCOTT MCBRIDE has been appointed director of the Timber Development Association.

Mr. C. FORD recently joined the Lincoln Foundry Corporation, Los Angeles, as plant manager.

Mr. J. STANTON has been appointed foundry superintendent at the Durgapur Steel Project, India.

Mr. P. V. MUDUGAL joined M. Bhimasenappa & Bros., Mandipet, Davangare City, India, recently.

Rear Admiral G. C. ROSS has joined the staff of Blackburn Aircraft, Limited, as service liaison officer.

Mr. J. SCHOLES has been made foundry manager of National Machinery Manufacturing, Limited, Bombay.

Mr. J. M. SMITH has gone to Australia to become chief metallurgist with Metters-Clow Company, Limited, Melbourne.

Captain GEORGE E. COLES has resigned as chairman and from the board of Barrow Hematitic Steel Company, Limited.

Mr. J. A. W. GILL has been appointed a director of Steele & Cowlishaw, Limited, a member of the Baker Perkins group.

Mr. T. RAMCHANDRAN has been appointed assistant professor of metallurgical engineering at the Indian Institute of Technology, Madras.

Mr. W. S. PERKINS has been appointed divisional executive (Rugby) of the A.E.I. Transformer division of Associated Electrical Industries, Limited.

Mr. M. H. MORFEY has left Midland Rollmakers, Limited, to take up a position with the London Aluminium Company, Limited, Wolverhampton.

Mr. C. R. TEARNE, formerly technical sales manager of Churchill Gear Machines, Limited, of Blaydon-on-Tyne, has been appointed director of the company.

Mr. W. THOMPSON, works manager, has been appointed chairman of Peter Brotherhood, Limited, in succession to Mr. A. MARCUS NEAL, who has resigned.

Mr. VERNON STOTT, managing director of James Stott & Company (Engineers), Limited, has been elected to the board of Glover & Main, Limited, the parent company.

Mr. J. G. CHRISTOPHER, Mr. V. COFFEE, Mr. A. J. FORD, Mr. D. A. NEILL and Mr. G. J. STROWGER have been appointed executive directors of Thorn Electrical Industries, Limited.

Mr. J. JARVIS has taken up the post of chief metallurgist with the Fulwood Foundry Company, Limited, on resigning his position of foundry metallurgist with Newton Chambers & Company, Limited.

Mr. GEORGE BOOTH, progress chaser, David Brown Corporation, Huddersfield, has retired after 36 years' service. He was presented with a cheque by Mr. A. Avison, deputy managing director of the Corporation.

Mr. B. S. PRITCHARD has retired from the service of the Patent Shaft Steel Works, Limited, and relinquished his seat on the board of the company. He joined the company in 1927 and was appointed a director in 1944.

Mr. W. H. DIAMOND has been appointed to the board of Braithwaite & Company Structural, Limited. The company's central design office and estimating department at West Bromwich will continue to be under his direction.

Mr. J. BERNSTEIN, A.R.I.C., A.I.M., has resigned his position as works and foundry manager with Simplex Electric Company, Limited, and has been appointed works director of London Aluminium Company, Limited, Wombourne.

Mr. C. G. MOIRA and Mr. M. G. NIX have been appointed directors of the High Precision Equipment Company, Limited, machine-tool manufacturers, Bletchley, Bucks, and Mr. J. E. L. ROBINSON has retired from the board.

Mr. J. C. BROOMAN has been appointed export sales director and Mr. E. A. KING financial director of Black & Decker, Limited. Mr. J. H. LONGLAND has been appointed sales manager in the UK, and Mr. R. K. SYMMONS marketing manager.

Mr. ALEX LAURENCE, formerly secretary of Hawker Aircraft (Blackpool), Limited, has been appointed secretary of Hawker Siddeley Aviation, Limited. He succeeds Mr. D. E. HAYNES, who became secretary of Bristol Siddeley Engines, Limited, on October 1.

Mr. C. E. H. ECKERSLEY has relinquished his executive duties as sales director of Davidson & Company, Limited, Belfast, but continues his association with the company as a member of the board and in a consultative capacity. Mr. W. R. MAGOWAN, general sales manager, has been appointed sales director.

Mr. ROBERT D. HAIR, who has retired from Chattan Foundry, Bonnybridge, joined the firm in 1945 as technical consultant. Since then he has assisted in the progressive development of buildings, machinery and plant expansion. Presentations were made to him by directors and employees and a complimentary dinner was given in his honour.

Sheepbridge Engineering Group announce the appointment of Mr. J. T. DAVENPORT as general manager of Sheepbridge Equipment, Limited (Foundry Division), Chesterfield. Mr. W. MCLELLAND, of Whitley Bay, succeeds Mr. Davenport as foundry manager of Sheepbridge Alloy Castings, Limited, Sutton-in-Ashfield, Notts.

Mr. C. H. NEAL, works manager of Newton Brothers (Derby), Limited, electrical engineers, of Alfreton Road, Derby, has retired after being associated with the firm for 42 years. As a memento of the occasion, Mr. G. F. G. Hinnings, a director and general manager, presented Mr. Neal with a camera and projector, on behalf of the workpeople, staff and directors.

Mr. JOHN PATON, a director of P. & W. MacLellan, Limited, iron and steel merchants, Glasgow, has, on medical advice, decided to retire from business. For 50 years he has been associated with the company's iron and steel departments and has been a director for the past 13 years. He will be succeeded by Mr. DAVID W. DUGUID, a director of the company.

Mr. ARTHUR BROWN, works manager at Milnwood, Mossend, of Smith & McLean, Limited, has been appointed rolling mill superintendent of the Pacific

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Steel Works in Auckland, New Zealand. The new firm is a consortium of four companies—Colvilles, Limited; Stewarts and Lloyds, Limited; Guest, Keen & Nettlefolds, Limited, and Fletcher Holdings of New Zealand.

Following the integration of the various companies of the CKS Group United Metals, Mr. C. ARTHUR ABRAHAMS has been elected to the board of the parent company, CKS Group United Metals, and also to the CKS Group, the main trading subsidiary. Mr. L. W. SNAITH becomes a director of the parent company and Mr. STUART YOUNG, chartered accountant, has resigned since his firm is one of the auditors of the CKS Group.

Mr. ROGER M. HOYLE, a steel moulder in the Farington foundries of Leyland Motors, Limited, retired recently after completing over 43 years' service with the company. Joining the foundries in 1918 during their early years of production, Mr. Hoyle was first engaged in the production of large castings for solid-tyred vehicles. He was given number one as his foundry employee check number—a number which he has been allowed to retain because of his long service.

Mr. M. A. FIENNES, chairman and managing director of Davy-Ashmore, Limited, left by air on October 18 to spend a week in the United States. He is taking part in the special meeting of the Iron and Steel Institute there. He goes on to Canada at the invitation of the Metallurgical Society of the American Institute of Mining, Metallurgy and Petroleum Engineers. Shortly after his return from the United States and Canada Mr. Fiennes will leave for South Africa to visit the South African subsidiary of the Davy-Ashmore Group there. Mr. Fiennes has been nominated president-elect of the Iron and Steel Institute.

Translation Services

From amongst the most recently published lists of translations available from the Iron & Steel Institute (4, Grosvenor Gardens, London, S.W.1.), the following have been selected as being of interest to founders. The price quoted is that for single copies, postage extra, there being reductions for quantities ordered. Readers writing for translations, or for further information, should mention this JOURNAL when doing so.

BISI 2119 WEIGHING OF WAGONS, LORRIES AND BELT CONVEYORS IN THE IRON AND STEEL INDUSTRY. Brochu, M. (From French.) (£7 10s.) A discussion of principles and types of weighing device with a brief account of installations and notes on costs. (*JISI* abstract.)

BISI 2359 DENITROGENIZATION OF MOLTEN STEEL WITH TITANIUM UNDER PRODUCTION CONDITIONS. Gurevich, Yu.G. (From Russian.) *Izvest. VUZ Chernaya Met.*, 1961 (5), 58-67. (£4 5s.)

BISI 1180. Pt. IV. PROBLEM OF CLEAN AIR, WITH SPECIAL REFERENCE TO THE IRON AND STEEL INDUSTRY, PARTICULARLY STEELWORKS. Guthmann, K. (From German.) IV—Keeping the air clean, an obligation and problem of our time (with discussion) (with bibliog., 64 refs.). *Radex Rund.*, 1961 (1), Feb., 449-484. (£10.) History of dust abatement measures; legal provisions in respect of air purification abroad and in the German Federal Republic; specifications for limiting of dust and smoke discharge; dust removal and gas cleaning in sinter plants, O.H. plants, L.D. plants, Thomas converters; elimination of brown fume; L.D. converter and foundry Bessemer converter. (Author's summary.) *Note:* Parts I and III are available from BISITS; part II appeared in *Iron & Coal Trades Review*, 1959, April 10, 831-838; April 17, 903-908.

BISI 2207 EFFECT ON STEEL QUALITY OF THE MANNER OF INTRODUCING ALUMINIUM. Brainin, I. E., and N. V. Gubenko. (From Russian.) *Izvest. VUZ Chernaya Met.*, 1959, Oct., 89-98. (£4 15s.) Investigations reported have shown that the introduction of Al into the ladle by tubes filled with the molten element did not bring about any appreciable changes in the macro- and micro-structures of the steel. Only the quantity of oxides was slightly reduced. The original and the resulting grains, after tempering at between 850 and 1,050 deg. of steels with 0.8 to 0.5 kg Al/t introduced molten in tubes, were larger than when the Al was introduced in pieces at the rate of 1 kg Al/T. (*JISI abstract.*)

BISI 2301 ARSENIC AND PHOSPHORUS IN HIGH-ALLOY CR AND CR/NI STEELS. Benes, F., and D. Tlusta. (From Czech.) *Hutn. Listy*, 1960, *15* (12), 929-936. (£8 10s.) The effect of As (0.01-0.2 per cent.) and of P (0.025-0.1 per cent.) on the properties of heat-resistant ferritic chromium steels and on austenitic Cr/Ni was investigated. As in excess of 0.06 per cent. leads to a deterioration of heat resistance, corrosion resistance and weldability of the ferritic steels. Similar effects are found in the stainless steels as well, where an appreciable loss of notch-impact strength is also associated with As contents exceeding ~ 0.06 per cent. The effect of P, also in excess of about 0.05 per cent., results in comparable detrimental effects. (*JISI* abstract.)

BISI 2306 INTER-RELATION BETWEEN THE CARBON CONTENT OF STEEL SHEETS, THE ENAMEL AND THE FIRING TEMPERATURE DURING THE PROCESS OF VITREOUS ENAMELLING. Horstmann, D. (From German.) *Stahl Eisen*, 1961, *81*, May 11, 629-640. (£6 15s.)

BISI 2365 CONTROL DEVICE FOR THE ELECTRIC CURRENT IN STEEL-MELTING ARC FURNACES. Svenchanskii, A. D. (From Russian.) *Vestnik Elektroprom.*, 1960, Aug., 23-26. (£5 5s.)

Translations in Preparation

Translations in course of preparation include:—

BISI 2416 EFFECT OF STEEL SCRAP IN THE MIXTURE FOR MELTING IRON IN THE CUPOLA. Siepmann, H., *et al.* (From German.) *Giesserei*, 1960, *47*, Nov. 3, 608-614.

BISI 2424 INFLUENCE OF TRACE ELEMENTS ON SEMI-KILLED STEELS. Greenway, P. (From German.) *Stahl Eisen*, 1961, *81*, Aug. 3, 1047-1057.

BISI 2445 EQUILIBRIA BETWEEN CARBON, OXYGEN AND METALS SUCH AS CHROMIUM AND MANGANESE IN RELATION TO TEMPERATURE DURING OXYGEN REFINING IN THE BASIC ELECTRIC-ARC FURNACE. Tesche, K. (From German.) *Arch. Eisenhütt.*, 1961, *32*, July, 437-450.

BISI 2453 EFFECT OF THE MATERIAL AND INTERNAL STRESSES ON THE LIFE OF BASIC CONVERTER-STEEL INGOT MOULDS. Gerkan, W. von. (From German.) *Stahl Eisen*, 1961, *81*, Aug. 31, 1192-1203.

BISI 2458 CARBON DETERMINATION IN STEELS BY COMBUSTION AND CONDUCTIMETRY. Boulin, R. (From French.) *Chim. Anal.*, 1958, Mar., 72-76.

BISI 2461 STEELS AND CAST IRONS WITH HIGH-BORON CONTENT. Vrtel, J. (From Czech.) *Hutnické Listy*, 1960, *15* (12), 945-950.

Other People's Translations

The initials CDS, etc., stand for the organization to which enquiries for the following translations should be made, quoting the reference numbers. Addresses are given at the end of the list.

CDS I.T. 3339 DOSAGE COLORIMETRIQUE DE L'ALUMINIUM DANS LES ACIERS. Doubek, L. *Hutnické Listy*, 1960, *15* (6), June, 477-78.

CDS I.T. 3523 ETUDE DES FACTEURS DE L'OXYDATION DU CARBONE DANS LE FER LIQUIDE. Dun, E., and S. I. Filippov. *Izv. VUZ Chern. Met.*, 1960, *3* (1), Jan., 16-23.

AL. LABS. CASTING IN ANODIZED MOULDS. Petrov., O. L. *Lit. Proizv.*, 1960 (4), p. 46.

CDS I.T. 3425 EFFETS DU MOUVEMENT DE LA PHASE LIQUIDE SUR LA SOLIDIFICATION DES PIECES MOULEES. Rosenfel'd, S. E., S. B. Yudin, and M. M. Levin. *Lit. Proizv.*, 1957, Nov., 24-26.

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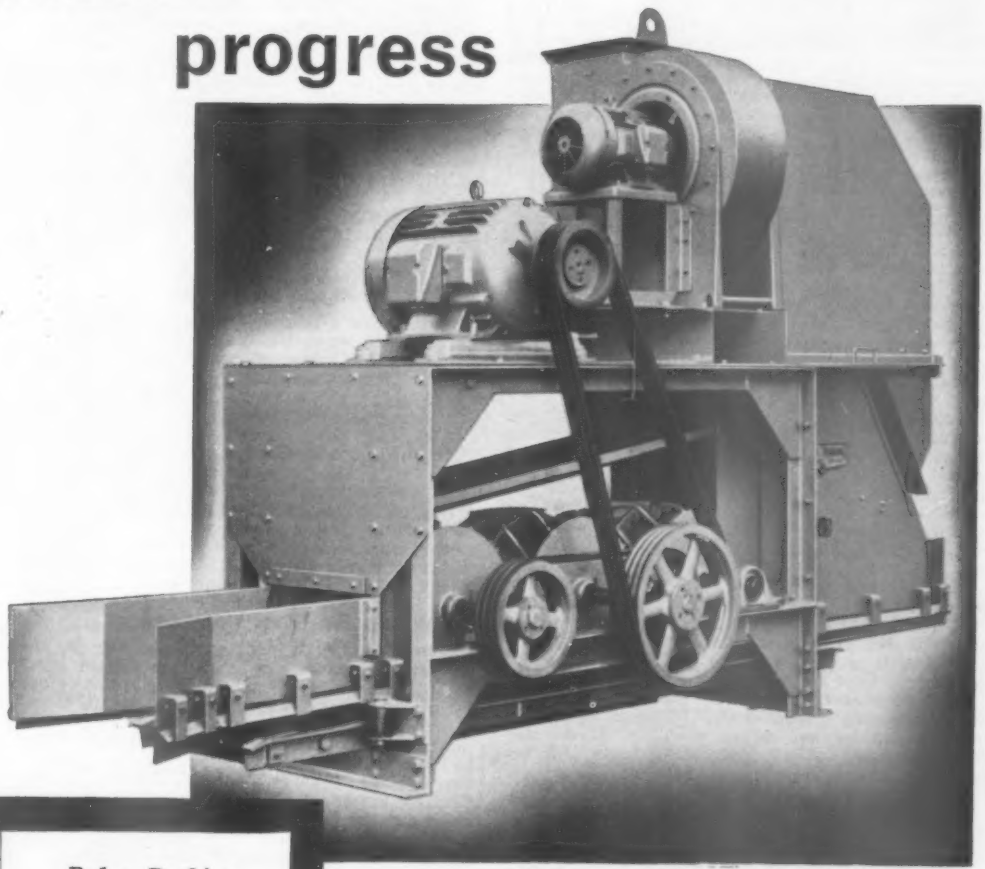
Symbols for Sources of Translations

AL. LABS: Aluminium Laboratories, Limited, Banbury, Oxon. CDS: *Centre de Documentation Sidérurgique*, 6, Rue de Lota, Paris, 16, France. US/AEC: Office of Technical Services, Department of Commerce, Washington 25, D.C., USA.

pattern for progress



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Raw Material Markets

Iron and Steel

Overall outputs of iron castings continue on a fluctuating scale and, although a steady demand is maintained on most of the iron foundries, the quantities now being called for are generally below previous levels. Comparatively, the engineering and speciality foundries are still the most favourably employed, and while most of them have so far been able to maintain a five-day working week, difficulty may be experienced in keeping up this rate of production unless demand improves.

Most of the light foundries are still short of work. The call for castings from the domestic utensil trade is quiet and, although for builders' castings the demand is steady, more work could be undertaken.

All grades of pig-iron are plentiful, the steelworks being well supplied with basic pig-iron. The reduced call has necessitated the closing down of some furnaces whilst others are producing at lower levels in order to regulate outputs with demands. Fortunately overseas buyers are taking up some of the spare tonnages which are available.

Much larger quantities of the foundry grades of pig-iron could be made available. The engineering and speciality foundries maintain a reasonably good demand for the low phosphorus irons, and they are also taking up fair quantities of hematite and some refined irons. The demand for the high phosphorus irons is moderate. Some consignments of foundry pig-iron are being shipped abroad, but orders are difficult to obtain against strong competition.

Business continues moderate for the products of the re-rollers. The call for small bars, light sections, and strip is well below output levels. A fairly good demand continues to be made for reinforcing rods and bars. Orders at present arising are readily completed and there is little forward booking.

Home steelworks have no difficulty in meeting present demands for steel semis. The mild steel grades are very plentiful, and carbon steels can also be supplied adequately. Alloy steels are also available but delivery dates are more extended.

Non-ferrous Metals

The copper price in London has been holding steady, variations on either side of £230 a ton being negligible. This has been due to the general feeling that prices will not go down much further or, in the absence of some cheering news, much higher. However, the further easing of the stock position in LME warehouses has given the market a firm undertone and should demand revive from this country and from the Continent the quotation would soon reflect the better trading conditions.

In the US demand for the red metal is good and steady despite the lowering of the intake price for scrap by ¼ cent to 25¼ cents a pound. During September, according to figures released by the Copper Institute, refined production in the US was lower and domestic deliveries higher, with the result that end-month stocks fell to 77,813 tons, compared with 95,177 tons at the end of the preceding month. The US price of 31 cents a pound is still applicable to both custom smelters and producers.

Not a great deal has happened in the tin market in any of the three main centres, London, Singapore, and New York where the price is moving narrowly around $1.20 a pound. The main feature has been the sale of 300 tons of tin from the Texas smelter stock. It was hoped that the GSA would consider the tenders inadequate, but, in the event they were accepted at slightly lower levels than the current market rate.

Lead in London has been an inconclusive market with the price hovering around £63 a ton. Stocks in official warehouses are down to 10,584 tons and the undertone is firmer. In the US the market is quietly steady and the price unchanged at 11 cents a pound.

Zinc, like lead, is awaiting the outcome of the Lead-Zinc Study Group meeting in Geneva. It is thought that curbs on production may be recommended which has helped to keep the price steady at around £73 a ton. Stocks in official warehouses rose further last week and now stand at 9,622 tons. In the US the market is satisfactory and the price unaltered at 11½ cents a pound.

Export of Iron and Steel Scrap

At the request of the Ministry of Power the Board of Trade announce that arrangements have been made permitting the export of compressed baled iron and steel scrap not exceeding an f.o.b. value of £25 per ton, and of iron and steel scrap turnings and bearings not exceeding an f.o.b. value of £25 per ton from October 31, 1961, until February 28, 1962. An Open General Licence has been issued permitting the export of this material to any destination during that period.

Enquiries about this licence should be made to the Board of Trade, Export Licensing Branch, Gavrelle House, Bunhill Row, London, E.C.1. Copies of the Open General Licence (price 3d. each, by post 5½d.) will be obtainable from H.M. Stationery Office, Kingsway, London, W.C.2, and branches.

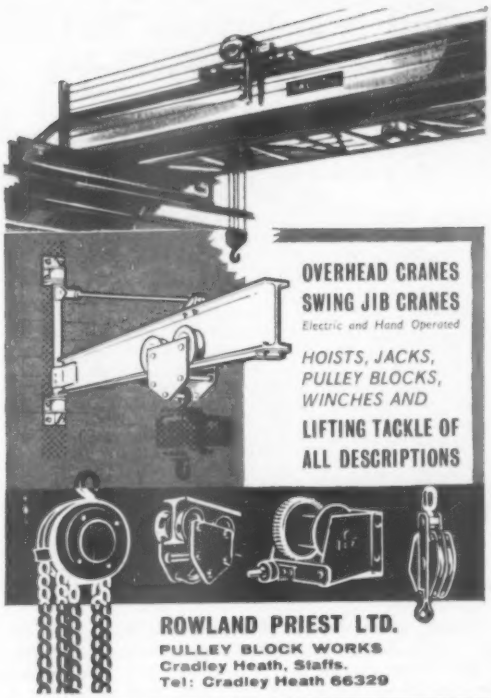
British Steel Executives visit America

Some 200 British steel executives are at present in America attending a special meeting of the Iron and Steel Institute (of London), the party being headed by the Institute's president, Sir Charles F. Goodeve. In addition to sightseeing tours, the party are visiting the Fairless Works of the United States Steel Company and the industrial areas in metropolitan New York, the Niagara Frontier, Ontario, Detroit, Cleveland, Chicago, Pittsburgh and Baltimore, departing for home on November 8.

Birmingham Engineering Centre Exhibits

Among exhibits on view at the Birmingham Engineering Centre on October 25 and 26, Prat-Daniels (Stroud), Limited, included a wet spark-arrestor for foundry cupolas; high-efficiency tubular dust-collectors aad fan stacks;; a Wetclone dust-collector; centrifugal fans; smoke-detection equipmen; a Turbocollecor; and a low-resistance dust-collector. The firm also featured the special services they offer in regard to industria ventilation, gas washing, pneumaic conveying, and drying, and drew attention to a model unit for fume incineration.

THE INAUGURAL MEETING of the new Industrial Water and Effluents Group of the Society of Chemical Industry will take place at the Royal Institution, Albemarle Street, London, on November 1 at 6.45 p.m. (preceded by light refreshment from 6.00 p.m.). The group chairman, Dr. B. A. Southgate, director, Water Pollution Research Laboratory, will speak on "The Industrial Water and Effluents Group." The chair will be taken by Lord Fleck, president of the Society of Chemical Industry. Visitors will be welcome.



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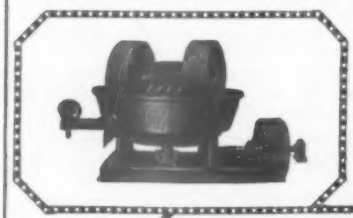

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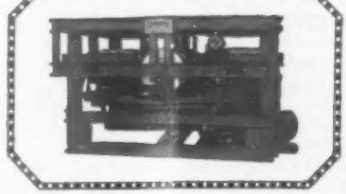

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Current Prices of Iron, Steel, and Non-ferrous Metals

(Basis prices, delivered unless otherwise stated. Prices following side headings marked* are subject to an increase of 1 per cent. under Iron and Steel Board Price Determination, 1961, No. 2.)

October 25, 1961

PIG-IRON

* **Foundry Iron.**—No. 3 IRON, CLASS 2, 10-ton lots or over, Middlesbrough, £21 17s. 0d.; Birmingham, £21 9s. 3d.

* **Low-phosphorus Iron.**—Over 0.10 to 0.40 per cent. P, 10-ton lots or over, £23 5s. 0d., delivered Birmingham; £23 10s. 0d., delivered Grangemouth.

Cylinder and Refined Irons.—North Zone, £25 6s. 6d.; South Zone, £25 9s. 0d.

Refined Malleable.—P, 0.10 per cent. max.; North Zone, £26 6s. 6d.; South Zone, £26 9s. 0d.

* **Hematite.**—Si less than 2 per cent, S. & P. over 0.03 to 0.05 per cent., 10-ton lots or over: N.-E. of England (local iron), £23 19s. 0d.; Scotland (Scotch iron), Zone S.1, £24 5s. 6d.; Sheffield, £25 9s. 0d.; Birmingham, £25 13s. 0d.; South Wales (Welsh iron), £23 19s. 0d.

* **Basic Pig-iron.**—£20 3s. 0d., delivered Staffs, Derbyshire, Notts, Lincs, Rutland, Northants, and Leicestershire in 10-ton lots or over.

FERRO-ALLOYS

(*per ton unless otherwise stated, delivered*)

Ferro-Silicon (6-ton lots and over).—45 per cent. Si, £45 0s. 0d. to £48 0s. 0d., scale 15s. 0d. per unit, lumpy, 75 per cent. Si, £62 10s. 0d. to £66 10s. 0d., scale 15s. 0d. per unit, lumpy.

Ferro-vanadium.—50/60 per cent., 22s. 6d. per lb. of V.

Ferro-molybdenum.—65/70 per cent., carbon-free, 14s.1d. per lb. of Mo.

Ferro-titanium.—20/25 per cent., 2-3 per cent. Cu, £250 0s. 0d.; 38/40 per cent., commercially carbon-free, £287 0s. 0d.

Ferro-tungsten.—80/85 per cent., 9s. 11d. per lb. of W.

Tungsten Metal Powder.—98/99 per cent., 12s. 11d. per lb. of W.

Ferro-chrome (6-ton lots and over, lumpy).—4/6 per cent. C, £80 10s. 0d. to £84 10s. 0d., basis 60 per cent. Cr scale 27s. 0d. to 28s. 6d. per unit; over 6 per cent. C, £79 0s. 0d. to £82 10s. 0d., basis 60 per cent. Cr, scale, 27s. 0d. to 28s. 6d. per unit; 2 per cent. C,* 1s. 8d. to 1s. 11d. per lb. Cr; 1 per cent. C,* 1s. 8d. to 1s. 11½d. per lb. Cr; 0.15 per cent. C,* 1s. 9½d. to 2s. 0½d. per lb. Cr.; 0.10 per cent. C,* 1s. 9½d. to 2s. 0½d. per lb. Cr; 0.06 per cent. C,* 1s. 10½d. to 2s. 1d. per lb. Cr. * Average 68-70 per cent.

Metallic Chromium.—98/99 per cent., 6s. 9d. per lb.

Metallic Manganese.—94/96 per cent., carbon-free, £275 0s. 0d.; 96/98 per cent., £285 0s. 0d.

Ferro-columbium.—65/67 per cent. Cb + Ta, 19s. 0d. per lb., Cb + Ta.

Ferro-manganese (Standard).—78 per cent., £58 10s. 0d.

SEMI-FINISHED STEEL

* **Re-rolling Billets, Blooms, and Slabs.**—BASIC: Soft u.t., 100 tons and over, £31 15s. 6d.; tested, 0.08 to 0.33 per cent. C, 100 tons and over, £32 5s. 6d.; hard (0.41 to 0.60 per cent. C), 50 tons and over, £33 17s. 0d.; silico-manganese, 50 tons and over, £42 16s. 6d.; free-cutting, 50 tons and over, £35 4s. 6d. SIEMENS MARTIN ACID (50 tons and over): Up to 0.25 per cent. C; £40 11s. 0d.; silico-manganese, £43 4s. 0d.

* **Billets, Blooms, and Slabs for Forging and for Stamping** 50 tons and over).—BASIC: Soft, up to 0.33 per cent. C, £37 0s. 0d.; basic, hard, over 0.41 up to 0.60 per cent. C, £38 2s. 6d.; acid, up to 0.25 per cent. C, £41 14s. 0d.

FINISHED STEEL

* **Heavy Plates and Sections** (50 tons and over).—Ship plate (N.-E. Coast), £40 7s. 0d.; boiler plates (N.-E. Coast), £42 17s. 0d.; floor plates (N.-E. Coast), £41 16s. 0d.; angles (N.-E. Coast), £38 1s. 6d.; joists (N.-E. Coast), £37 17s. 6d.

* **Small Bars, Sheets, etc.**—Rounds and squares, under 3 in., and flats 5 in. wide and under, untested soft basic, 50 tons and over, £39 1s. 0d.; under 10 tons to 4 tons, £40 18s. 6d.; under 4 tons to 2 tons, £41 3s. 6d.; hoop and strip, coils, 100 tons and over, £38 0s. 0d.; uncoated strip mill coils, hot rolled, under 3 mm. to 12g., 25 tons to under 50 tons, £43 16s. 0d.; black sheets (hand mill), 24g., 10 tons and over, £57 14s. 6d.; galvanized corrugated sheets, 24g., 10 tons and over, £67 4s. 0d.

Alloy Steel Bars.—1 in. dia. and up: Nickel, £67 16s. 0d.; nickel-chrome, £100 18s. 0d.; nickel-chrome-molybdenum, £113 11s. 0d., in lots of 25 tons and over.

NON-FERROUS METALS

Copper.—Cash, £228 10s. 0d. to £228 15s. 0d.; three months, £229 0s. 0d. to £229 5s. 0d.; settlement, £228 15s. 0d.

Copper, Tubes, etc.—Solid-drawn tubes, 2s. 2¼d. per lb. rods, 247s. 0d. per cwt. basis; 20 s.w.g., 382s. 0d. per cwt.

Tin.—Cash, £946 0s. 0d. to £948 0s. 0d.; three months £951 0s. 0d. to £952 0s. 0d.; settlement, £948 0s. 0d.

Lead (Refined Pig).—Second half October, £60 12s. 6d to £60 17s. 6d.; second half January £62 0s. 0d. to £62 2s. 6d. settlement, £60 17s. 6d.

Zinc.—Second half October, £71 0s. 0d. to £71 2s. 6d.; second half January, £72 0s. 0d. to £72 2s. 6d.; settlement, £71 2s. 6d.

Zinc Sheets, etc.—Sheets, 15g. and thicker, all English destinations, £109 10s. 0d., rolled zinc (boiler plates), all English destinations, £107 5s. 0d.; zinc oxide (Red Seal); d/d buyers' premises, £90 0s. 0d.

Brass Tubes, etc.—Solid-drawn tubes 1s. 9¾d. per lb.; sheets to 10 w.g., 198s. 6d. per cwt.; wire, 2s. 8¾d.; rolled metal, 198s. 6d. per cwt.

Brass (Brazing).—BS1400, SCB2, £175; SCB3, £171.

Brass (High Tensile).—BS1400, HTB1, £191; HTB2 £211; HTB3, £227.

Gunmetal.—BS1400, LG2, £210; LG3, £220; G1, 1½% £280; G1 ½% £294.

Phosphor Bronze.—BS1400, PB1 (AID released), £312; PB4 £300; BS1400, 90/10/1%, £299.

Leaded Phosphor Bronze.—BS1400, LPB1, £235.

Phosphor Bronze Strip, etc.—Strip, 300s. 3d. per cwt.; wire, 4s. 2¼d. per lb.; rods, 3s. 5d.; tubes, 3s. 5d.; chill cast bars, solids 3s. 5¼d.; cored, 3s. 6¼d. (CHARLES CLIFFORD LIMITED).

Nickel Silver, etc.—Rolled metal, 3 in. to 9 in. wide × 0.056, 3s. 11¾d. per lb.; round wire, 10g. in coils (10 per cent.), 4s. 4¾d.; special quality turning rod, 10 per cent., ½ in. dia., in straight lengths, 4s. 3¾d. All prices are net.

Other Metals.—Magnesium, ingots, 2s. 2¼d. to 2s. 3d. per lb.; Antimony, English, 99 per cent., £230 0s. 0d. Quicksilver, ex-warehouse, £60 0s. 0d. Nickel, £660 0s. 0d. Aluminium, ingots, £186 0s. 0d.; aluminium bronze (BS1400), AB1, £237 AB2, £245.

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Advertisements (accompanied by a remittance) and replies to Box Numbers should be addressed to the Advertisement Manager, Foundry Trade Journal, John Adam House, 17/19, John Adam Street, Adelphi, London, W.C.2. If received by first post Monday advertisements can normally be accommodated in the following Thursday's issue.

SITUATIONS WANTED

PROGRESS / PLANNING MANAGER, 33, seeks position, fully experienced all modern production methods. Box PP130, FOUNDRY TRADE JOURNAL.

WORKS FOUNDRY MANAGER, 42, with several years' useful outside sales experience, seeks position. Time served paternmaking, foundry, engineering apprenticeship. Full control all aspects jobbing, mechanised, non-ferrous, grey iron, good connections. Box WF131, FOUNDRY TRADE JOURNAL.

MANAGER, A.M.I.B.F., seeks executive position with Company wishing to expand their production and interests. Experience in grey iron, malleable and aluminium. Mechanised and semi-mechanised production. Mechanised plant design. Jobbing. CO, moulding to 4 tons. Present situation Yorkshire. Box MA24, FOUNDRY TRADE JOURNAL.

SITUATIONS VACANT

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FOUNDRY/WORKS MANAGER required for West Midlands repetition Malleable Iron Foundry with Machine Shops. Must be experienced and have ability to organise and control labour. Full particulars please, in confidence. Box FW15, FOUNDRY TRADE JOURNAL.

METALLURGIST (Foundry) to be responsible for melting control and heat-treatment, etc., in highly mechanised Malleable Iron Foundry. Minimum qualification is H.N.C. Metallurgy with some foundry experience, and ability to work on own initiative. Applications to DIRECTOR, Shotton Bros., Limited, Lodgefield Road, Halesowen.

FOUNDRY TECHNICIAN for grey iron foundry producing plate and cored castings up to 10 cwt. Young man aged about 30 preferred, with experience in Sand Rammer and Jolt Squeeze machines, green sand and CO, production methods. Quality control activities will be main responsibility. National Foundry College training an advantage. Apply PERSONNEL OFFICER, Thomas Potterton, Ltd., Emscote Road, Warwick.

SITUATIONS VACANT—*contd.*

Council of Ironfoundry Associations

EDUCATION AND TRAINING

THE Council is expanding its Training Services to the industry and invites applications for the appointment of an ASSISTANT EDUCATION AND TRAINING OFFICER.

The appointment is mainly concerned with the organisation and supervision of management and supervisory courses, general and technical, which are being rapidly expanded to meet the industry's demands, and to assist the Education and Training Officer generally. There will be a considerable amount of travel within the U.K.

Candidates should preferably be under 35 years of age and hold a degree or N.F.C. Diploma or similar technical qualification. Knowledge of the ironfoundry industry and teaching ability and experience would be an advantage.

The appointment is based in London and a salary appropriate to qualifications and experience plus excellent pension scheme is envisaged.

Forms of application can be obtained from: THE EDUCATION AND TRAINING OFFICER, 14, Pall Mall, London, S.W.1.

SHIFT CHEMIST required for analytical control. Experience in cupola melting and electric furnace procedure preferred in cast iron and/or steel. No weekend shifts. Attractive position with well established company in Bilston. Apply in first instance to: PERSONNEL MANAGER, Bradley & Foster Ltd., Darlaston Iron Works, Darlaston, South Staffs.

REPRESENTATIVE required by Midland foundry manufacturing light grey iron and non-ferrous engineering castings. Salary and commission. Apply Box RR27, FOUNDRY TRADE JOURNAL.

FOUNDRY FOREMAN, aged between 25 and 45 with practical experience and good technical background, required for grey iron foundry in West Riding of Yorkshire using machine and plate moulded methods producing 20 tons per week. Superannuation scheme in operation. Write in first instance stating age, experience and salary required, to Box FF129, FOUNDRY TRADE JOURNAL.

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TECHNICAL REPRESENTATIVES

MEDIUM sized steel foundry in Sheffield area requires THREE TECHNICAL REPRESENTATIVES, one for the London and Home Counties, one for the Midlands, and one for the Lancashire and West Riding area. Applicants should not be over 35 years of age. Sales experience desirable but ability to be able to read casting drawings essential. Good salary, car and excellent pension scheme. Write Box TS23, FOUNDRY TRADE JOURNAL.

AGENTS

MANCHESTER CONSULTANT and AGENT willing to consider further agencies, Iron and Steel Castings and Machining. Box MC24, FOUNDRY TRADE JOURNAL.

SMALL West Midlands Grey Iron Foundry wishing to expand seeks AGENTS to introduce repetition work, commission only basis. Foundry capable of competitive prices and efficient deliveries. Box SW28, FOUNDRY TRADE JOURNAL.

WELL established Firm of Manufacturers' Agents wish to appoint AGENT to cover (1) Midlands and the West and (2) Cheshire, Lancashire and Yorkshire. Commission and part expenses. Reply, giving particulars of experience, etc., to SECRETARY. Box WE9, FOUNDRY TRADE JOURNAL.

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PATENTS

THE Proprietor of Patent No. 697108 for "Improvements in or relating to Heat Regenerator Packing Materials," desires to secure commercial exploitation by Licence or otherwise in the United Kingdom. Replies to Haseltine Lake & Co., 28, Southampton Buildings, Chancery Lane, London, W.C.2.

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MACHINERY WANTED—*contd.*

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MOULDING BOXES required—steel or cast iron. Heavy section. Sizes 4 ft. to 10 ft. DUDLEY FOUNDRY Co., LTD., Moor Lane, Brierley Hill, Staffs.

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SPERMOLIN "Minor" core sand mixer, and Spermolin core extruder, less motors. Advertiser will recondition older machines. Box SM20, FOUNDRY TRADE JOURNAL.

STERLING or Sterling type steel moulding boxes required. Must be in good condition. Sizes from 12 in. × 12 in. × 4 in. deep upwards. IRCAST FOUNDRIES, LTD., Underbank Mills, Whitworth, Rochdale. Telephone: Whitworth 3223.

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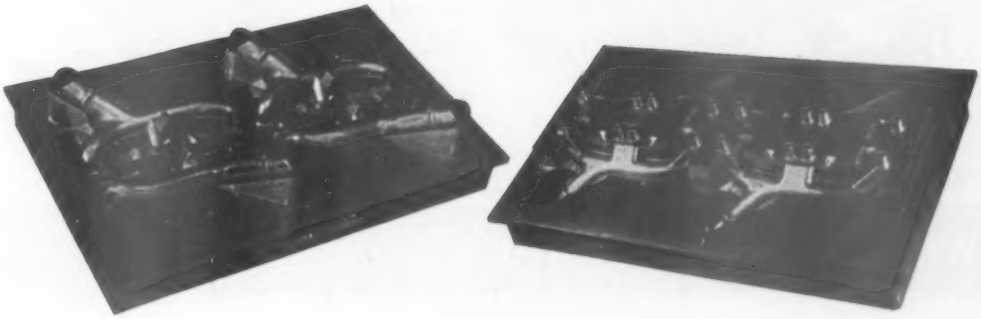

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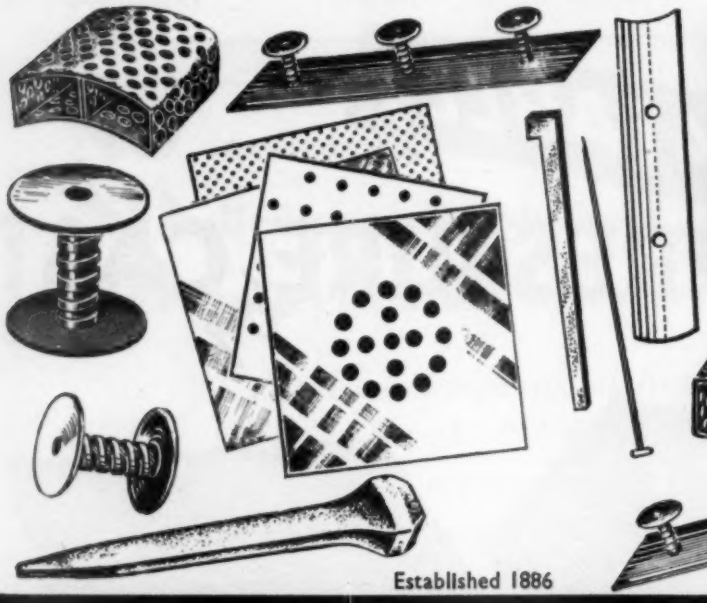

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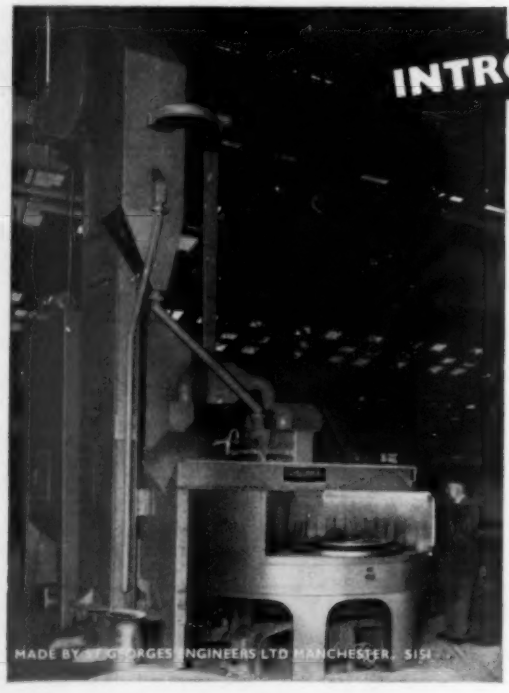

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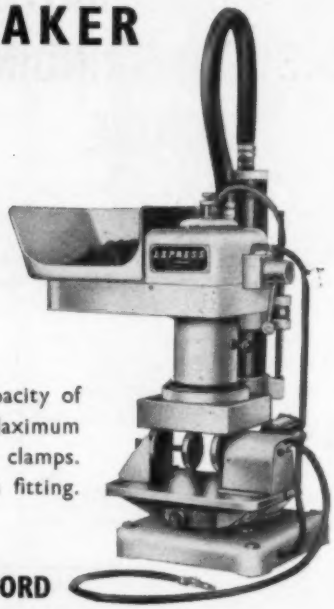

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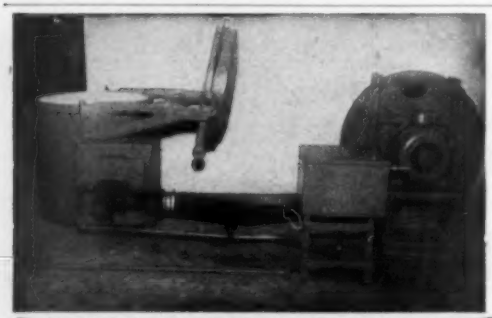

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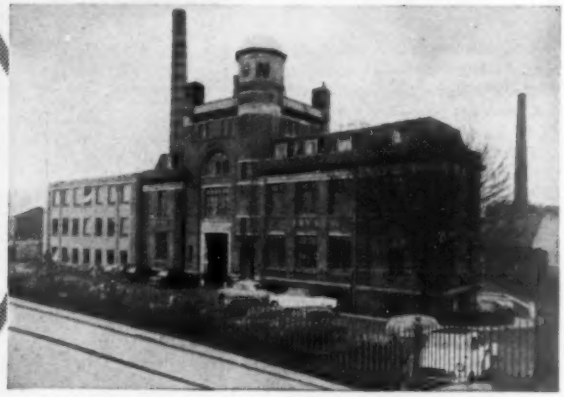

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